Union of Information Technology Enterprises of Armenia

Armenia: THE STATE OF IT INDUSTRY

Findings of the Survey of Information Technology Enterprises

Eurasia Foundation provided
prepared by UITE
support for the project,
with funds from USAID

May 2001

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PREFACE

According to numerous studies and assessments performed by independent observers since 1998 Armenia possesses a great potential for developing a strong presence in the world's information and communication technology industry particularly in Software sector, due to the former Soviet Union legacy when Armenia has been specialized in information technology (IT) and electronics. After overcoming electricity supply shortages in 1991-1994 and following mass privatization, private companies – the end users – have established their businesses and the country's software sector came back on track and has accelerated its growth since 1997.

In December 2000, with the aim to boost IT industry development in Armenia, the Government announced IT industry as one of priority sectors for economic development and adopted the concept on sector development in April 2001. The majority of international donor organizations have also recognized IT industry development as their support priority area and some organizations like UNDP, UNIDO, WB, USAID, Eurasia Foundation, IESC, EU and other organizations have developed and/or have been developing their support programs and projects.

In May 2001 the eight most active Armenian resident software, internet service providers and EDP hardware companies established the Union of Information Technology Enterprises (UITE) of Armenia to contribute to the promotion of IT industry development. Due to the lack of comprehensive information on the state of IT industry in Armenia, UITE initiated a sectorial investigation following the objectives to gather information that would help to outline UITE strategy and activities. With the support of Eurasia Foundation (USAID funded), from November 2000 to January 2001 UITE surveyed 100 Armenian and foreign IT enterprises to identify the state of IT Industry in Armenia, focusing on its development potential and problems that should be addressed and develop recommendations in supporting of IT industry growth.

Due to time pressure and willingness to come up to the public with obtained information, UITE staff has decided to present the report on the State of IT industry in Armenia with only the most outstanding information of the conducted survey. However, we also present more data in forms of graphs and tables, which could serve as resource for more targeted and specific analysis. Additional figures and analysis are available upon request.

We consider this report as the first glance overview of the state of IT industry in Armenia, the findings of which already helped us to identify issues that should be addressed by our Union. We also hope that the readers could utilize the information presented in this report for development/corrections of their programs and projects. The UITE is open and ready for any cooperation.

Conclusions, opinions and recommendations presented in the report are developed by the authors and do not necessarily present the opinion of the Board of UITE and/or Eurasia Foundation, however they are based on their expert opinions. UITE staff admits that the report analysis and recommendations could highly benefit from any international consultancy and comparative analysis and we are ready to present more relevant information for that.

Viktoria Ter-Nikoghosyan
Managing Director of UITE

Union of IT Enterprises
Union of Information Technology Enterprises (UITE) and its Activities

Mission Statement
Marketing, Training, and Advocacy
resource for the IT industry
in support of Armenian IT SME's.

UITE is a union of business legal entities, it was established in May 6th, 2000, to consolidate industry issues for advocacy. UITE is a non-governmental, non-profit organization.

The principal objectives of the UITE, in accordance with its Charter, are the provision of member activities in the following areas of IT.

IT Promotion
Industry Specific Training
Advocacy/Lobbying
Industry Demographic Statistics and Data Base
Marketing Consultancy
Membership Support

The UITE members are the most active and profitable Armenian resident IT companies. Our member companies are continuing their rapid growth rate and increased their sales and product turnover by 250% over the previous year.
Through the efforts of UITE, there is a focus for addressing development issues in a unified and robust manner. In addition to the internal infrastructure building:

- UITE presented a jointly developed draft proposal on IT Development in Armenia for Parliamentary hearings on July 28, 2000.
- UITE lobbied the Armenian Government to recognize Information Technology Industry as a priority sector of the economy and succeeded in December 28, 2000.
- UITE has established a partnership with UVI, a German IT association.
- UITE collaborated with other associations and unions, such as the Chamber of Commerce of American companies in Armenia.
- UITE joined its efforts with AmCham in lobbying amendments in Armenian Copy Right legislation to improve Intellectual Property Rights law.

One of the end products of UITE is an in-depth survey completed in January 2001 and the prepared report on the state of the IT industry in Armenia that you are reading now. The other outcomes are the published catalogue of UITE members and the IT catalogue of Armenia. To continue its growth, in addition to member contributions, UITE receives support from several international organizations such as Eurasia Foundation, the IESC, the World Bank, the GTZ/ProSME (German Desk) and others.

Membership is growing steadily and UITE is continually looking to strengthen its contributions to additional member companies and with cooperative agreements with other similar associations around the world.

Hovhannes Avoyan - UITE President
Viktoria Ter-Nikoghosyan -UITE Managing Director

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ABBREVIATIONS

AUA- American University of Armenia
BLC- Bureau for Labor Statistics
CCS- Continental Consulting Strategies
CPA- Center for Policy Analysis of the American University of Armenia
E-Business- Electronic Business
E-Commerce- Electronic Commerce
EDP Hardware- Electronic Data Processing Hardware
EITO- European Information Technology Observatory
FDI- Foreign Direct Investments
GDP- Gross Domestic Product
GTZ- Promotion of Small and Medium Enterprises (German Desk)
ICT- Information and Communication Technology
IESC- International Executive Service Corps
IPR - Intellectual Property Rights
ISP- Internet Service Provider
IT- Information Technology
ICT- Information and Communication Technology
ITA- Information Technology Agreement (WTO)
ITI- Information Technology Industry
IT Services- Information Technology Services
IT Hardware- Information Technology Hardware
MIT- Ministry of Industry and Trade of RA
NGO- Non Governmental Organization
RA- Republic of Armenia
R&D- Research and Development
SITC - Standard International Trade Classification
SW- Software
UITE- Union of Information Technology Enterprises
UNDP- United Nations Development Program
UNIDO- United Nations Industrial Development Organization
USAID- United States International Development Agency
UVI- Unternehmensverband Informationssysteme – Union of Information Systems Enterprises
WB- The World Bank
WTO- The World Trade Organization

ACKNOWLEDGEMENTS

Preparation of the report „Armenia: The State of IT Industry“ would not have been possible without the support and valuable contribution from different organizations and individuals. However, the highest support we received form surveyed enterprises and would like to express our highest gratitude for fruitful cooperation to the Managers and the staff of surveyed IT companies.

UITE staff expresses its gratitude to the managers of UITE member companies for their expert evaluation for all collected data, valuable comments and advise on the analysis.

The survey has benefited from the external consultation for what we are truly thankful to IESC Country Director Ms. Lisa Scorsolini and Deputy Director Ms. Gayane Dallakyan. We have received assistance when outlining the scope of questionnaire during its development stage with the help and consultancy provided by Mr. Jerry Carpenter, the Managing Principal of CCS, Volunteer Expert assigned to the project by IESC. We would like also to thank the Implementation Team of Development Network NGO for their fruitful participation in several ‘brain storming’ for development of the scope of the survey and questionnaire design and development.

UITE expresses its special gratitude to Ms. Lucig Danielian, Sociologist, Professor of AUA, Head of Center for Policy Analysis of American University of Armenia and her staff for the support and kind readiness to process extra data than was envisaged by the contract and for kind assistance to conduct the after contract processing and analysis.

Special acknowledgement is due to the Eurasia Foundation and Mr. Artashes Kazakhetsyan, the Country Director in particular, for his guidance in the analysis and to Ms. Narine Sahakyan, Program Officer, for close collaboration and support in the preparation of this Report.

Recognition is due to Mr. Joern Rieken, Senior Advisor, Promotion of Small and Medium Enterprises & German Desk Conducted by INTEGRATION/GTZ; Ms. Marina Poghosyan, Training/OD Coordinator; Mr. Michael Zillich, Consultant and Trainer, for their valuable additions and recommendations during the stage of development and design of questionnaire.

The Report benefited also from the variety of opinions presented by Mr. Andrew Hovhannisyan, Executive Manager of HPLA and Mr. Georgy Burunsuzyan, Manager of Celesta Systems.

We also would like to thank Mr. Vladimir-Goran Kreacic, World Bank Sr. Enterprise Restructuring Specialist, Private and Financial Development Sector Unit, Europe and Central Asia Region, Ukraine, for his invaluable contribution to the introduction of interesting questions into the questionnaire, which helped us to make comprehensive survey on brain drain and workforce migration issues.

The Project cooperated with different International Organizations and we would like to specify the invaluable input of Mr. David Akopyan – Assistant Resident Representative UNDP, Program Officer; Mr. Victor Zakharian – UNIDO Senior Industrial Development Officer ITPO Coordinator; Mr. Yevgeny Kuznetsov the WB Economist, Private Sector Development, Latin America and Caribbean Region; Mr. Lev Freinkman - Poverty Reduction and Economic Management Europe and Central Asia Region.

STRUCTURE OF THE REPORT

CHAPTER I. SUMMARY OF THE STATE OF IT INDUSTRY IN ARMENIA

The chapter provides the classification of IT sub-sectors in Armenia adjusted for local factors as compared with the current world definition. This part of the report introduces the most outstanding findings of the conducted survey on the state of IT industry in Armenia for the end of 2000 and beginning of 2001. The reader will find here the brief treatment on the state of ITI in Armenia, its main issues of concern and perspectives for development, and summary of conclusions and recommendations.

CHAPTER II. ICT DEVELOPMENT IN THE WORLD AND ARMENIA'S OPPORTUNITY

The chapter presents the global trends on the ICT growth and provides an insight to what Armenia could do to keep abreast of the worldwide development. Armenia has long been the leading republic in the former Soviet Union what regards electronics and software development. Armenian programmers have recently acquired high reputation, mostly in US market for their high quality IT skills. The considerable potential is still out there, and the major task now is to utilize it as effectively as possible and reap all the benefits of the Digital Age, as commercial so social.

CHAPTER III. SURVEY METHODOLOGY

The survey methodology and questionnaires have been developed by UITE staff together with the IESC consultant and Development Network NGO team under the supervision of the Head of Center for Policy Analysis in American University of Armenia, professor Mrs. Danielian. The team members have personally visited the companies and interviewed the managers face-to-face. CPA of AUA processed the collected data and UITE staff in its turn, analyzed the data and prepared this report. The survey covers about 45% of the IT Industry enterprises, which provides highly reliable and accurate information.

CHAPTER IV. FINDINGS AND ANALYSIS OF ITI DEVELOPMENT TRENDS

IT Industry Development Dynamics. How did IT start? This sub-chapter briefly introduces to the reader the development dynamics of IT companies in Armenia. A comparative graph for establishment is presented separately, which allows tracing of the growth trends for each of the six IT sub-sectors. Such dynamic and rapidly growing sub-sector as the Software development is highlighted in more detail.

ITI Current Workforce, its Dynamics and Migration and Workforce Demand. This sub-chapter helps to get an insight into the IT labor market in Armenia and presents detailed treatment on the growth of IT skills and the diversification of specialties. Other aspects of IT workforce are covered in this sub-chapter i.e. migration of workforce within and outside the country and the negative impact of Military Service over the IT Industry.

State of IT Education in Armenia. What fuels the IT industry? The educational institutions have trained more than 13,000 IT specialists since 1961, an still do, possessing quite a feasible potential as with regard to technical capabilities, so with regard to highly qualified teaching personnel. The sub-chapter presents the profiles of the institutions, types of IT courses and training they provide and deliver.

The State of Telecommunications of IT Industry. The sub-chapter presents the increasing requirements to the capacity, quality, speed and security of communication lines that, endangers the growth of Armenian IT industry due to monopolistic nature of the telecom market. The survey revealed a wide dissatisfaction with the quality and high pricing of communications.

Business Problems. Various business problems are highlighted in this part. The problems firms often encounter with regard to IT Marketing and Management are highlighted. The sub-chapter also provides graphs with list of strengths and weaknesses of the companies as perceived by the managers.

Business Environment. The sub-chapter introduces the problems faced by IT companies, their opinions on the regulations and administrative barriers and presents improvements that they would like to be implemented.

ITI Development Potential for Capital Market. The issue of contribution of the most dynamic growing IT sector into capital market development in Armenian economy and the impact new regulations in the sphere on ITI are presented in more detail in this part of the report.

ITI Associations Market Development. The survey has revealed that some of the IT companies are members of associations and unions. The sub-chapter introduces the relative weight of these associations/unions in IT Industry in Armenia. The willingness of the companies to become a member of an association/union is also highlighted in this chapter.

ITI Physical Assets. The sub-chapter briefly presents to the reader the basic assets owned by the companies, what regards the Computer Hardware, working spaces and vehicles in use.

ITI Training Needs. The sub-chapter addresses the problems of training and re-training of top-level managers. Another issue is the organization of re-training courses for IT instructors to keep their expertise up to the market needs and enable them to deliver courses on the latest versions of CP languages. The issue of upgrading the current unemployed workforce is another question that the sub-chapter covers.

ITI Market Development Potential. This sub-chapter is dedicated mostly to three major issues: relatively inexpensive labor, a high potential for IT training and the availability of Diaspora contacts, which might be utilized for networking around the globe, are discussed.

CHAPTER V. CONCLUSIONS AND RECOMMENDATIONS

In spite of unfavorable environment and extremely poor telecommunications infrastructure, Armenian IT industry carves its way trying to find its place in the Digital Age. The main factors that contributed to the growth were the legacy from the former Soviet Union and the willingness of Armenian IT industry to go further rather to stay passive and watch how the world goes by.

Among the main hindrances for ITI development in Armenia are some issues of regulatory framework and its weak implementation and enforcement, such vital issue as the telecommunications infrastructure, which is actually the „blood circulation system“ for any economy, the military service which takes away the talents and forces some specialists to leave the country, IT education and re-training issues.

The brighter side however, is that despite all these obstacles and difficulties, the companies find the ways to survive and even manage to export their products, mainly software, to CIS and western countries. Another positive sign is the growing demand for IT skills.

The chapter presents a number of recommendations which would facilitate the development of ITI and if not completely, then at least partially remove the barriers which hamper the evolving of ITI in Armenia.

CHAPTER I. SUMMARY OF THE STATE OF IT INDUSTRY IN ARMENIA

First of all we would like to bring our readers attention to the classification of ITI in Armenia. It somewhat differs from the world practices due to local factors. The table 1.1 provides the definition of ITI for Armenia.

Table 1.1. IT sub-sectors in Armenia

Definition of IT Industry*	**Our definition of IT industry in Armenia according to the local realities**
I. Software (or IT Services) ➢ Package software: systems software and utilities, applications tools and applications solutions ➢ Professional services (including IT Education) ➢ Processing services ➢ Network services ➢ Hardware maintenance and support services	**I. Software (or IT Services)** ➢ Software ➢ Internet Service Providers ➢ IT Services (including Professional services, Processing services, Network services, Hardware maintenance and support services) ➢ IT Education
II. Hardware ➢ Electronic data processing (computer hardware and data communication equipment) /EDP Hardware/ ➢ Office equipment ➢ Telecommunications equipment ➢ Semiconductors ➢ Semiconductor manufacturing equipment ➢ Scientific, medical and other equipment ➢ Other components	**II. Hardware** ➢ EDP Hardware ➢ IT Hardware (including Office equipment Telecommunications equipment, Scientific, medical and other equipment and Other components)
III. Media for collection, storage, processing, transmission, and presentation of information.	**III. Media for collection, storage, processing, transmission, and presentation of information.**

*More details on IT industry products are presented in the Appendix 1 according to SIPT of WTO ITA.

1. ITI Dynamics. The survey identifies the following IT industry sub-sectors active in the field.
Software – 60 companies developing operating systems, applications, and systems or applications utilities and tools. Twenty-six of these companies are the subsidies with headquarters based mainly in USA (as per March 2001).
EDP Hardware – 29 companies manufacturing/assembling/selling of computers, and any connecting peripherals as internal so external, and computer accessories (as per December 1999)
IT Services – 35 companies, includes a large number of specialties as hardware maintenance, software support, network services, data centre services, professional services and processing services (as per December 1999).
IT Education – 24 institutions who are involved in the development and delivery of computer programming and user trainings in all aspects of hardware and software components above (as per December 1999)
Internet Service Providers (ISP) – 19 companies providing both public and proprietary access to the internet, connecting Armenia to the World Wide Web (as per December 1999)
IT Hardware – 55 companies involved in the manufacturing and/or sale of closely related IT components such as telecommunications and office reproduction equipment (as per December 1999)

Thirty eight software companies had been identified prior to the survey, and we have made the selection based on the list of available companies for the end of the year 2000 (a prerequisite to be in the full list for selection was to be active in the market for not less than an year, which means to be registered at the end of 1999). Besides, we have also identified additional, newly established 22 software companies (established in

2000 and as per March 2001). Moreover, 25 enterprises among 74 surveyed non-software companies fairly stated that they are developing software products as well. This means that there are at least 85 companies involved in packaged software development in Armenia. This figure could rise if we cover the rest of the companies, which were not included in the survey list.
Software, IT Education and IT services sub-sectors perform the most dynamics of growth, ISP and EDP Hardware perform moderate growth, at the same time there is no rapid development in IT Hardware sub-sector.

2. IT Workforce. IT industry continues to attract more professional and highly qualified workforce in the process of its reformation. In accordance with the survey information, the IT sector accounts for around 3,850 specialists, among them are computer programmers and computer scientists/engineers (67%), system analysts (6.57%) and computer hardware specialists (20%). We also took an account for IT instructors who work in educational institutions (6.5%). An assessment was made also for non-IT sectors of the economy which increased the total for IT employment to considerable ~ 4,700. The major non-IT employers are the Government and Banking sector. The survey has identified that the private companies prefer to subcontract IT companies for implementation of corresponding work rather than keep full-time IT personnel.
One of the key findings of the survey is the positive demand for IT skills. Thus, despite the general slowdown of the economy, the IT sector keeps on hiring computer programmers and scientists/engineers. Extrapolation brought us to the approximate employment figure of around 1600 of CP and CS/E in SW sector. The demand for Computer Programmers and Computer Scientist/Engineers in the Software sub-sector is around 700 specialists. The demand for System Analysts on the part of Internet Service Provider sub-sector is 237% of currently employed SA by ISP sub-sector (17 specialists in the surveyed ISP companies). The demand for IT workforce comprises almost 700 specialists for surveyed companies only. The extrapolation for the rest of the sector increases this figure up to 1800 (of which 88% for CP, SA, CS/E and IT Instructors) vacancies.
At the same time, there are more than 3,000 unemployed for CP, SA, CS/E and IT Instructors specialists in the market, and it seems that this relatively young workforce (under 40 years old) does not possess up-to-date qualification and market oriented skills to fill those vacancies.
Workforce migration rates within the republic also continue to grow. This serves as an excellent indicator of increasing opportunities and alternatives for employment, which is quite consistent with companies' establishment dynamics. The specialists continue leaving Armenia for overseas, however, the patterns of emigration trends have somewhat changed. If before the year 1995 the majority of specialists left consisted from highly qualified computer programmers, then after that, the foreign companies began attracting the IT instructors. The 70% of those who left after 1995 are IT instructors. Armenian education system once again proved its former high quality, although this is a too high price the country pays for its inability to retain professionals. Another finding is that 37% of call up age IT specialists have not join the military service and left the country, and this percentage comprises 20% from the total number of IT specialists who left the country.

3. IT Education. IT Education positively reflects the market demand for IT specialists, but is still slow in meeting the demand for IT qualified professionals. In addition, there are some obstacles in terms of government regulations and the mentality of decision makers who fail to follow the growing market demand.
One of most important findings in this field is the fact that 50% of IT educational enterprises are engaged in software development, which shows up the high professionalism of teaching staff. The educational institutions, mostly private ones, showed flexibility in adopting new computer programming languages into their curricula. It is also notable, that all newly adopted programming languages are related to Internet Technologies.

4. The State of Telecommunication. Internet and telecommunications are one of the biggest and most serious obstacles for ITI development in Armenia. It is obvious, that ArmenTel is not interested in the development of Internet and there are no incentives yet to change this situation.
The percentage of companies connected to the Internet reaches 92% with the exception of IT hardware category. Despite the high percentage of connectivity, more than 50% are connected via Dial-Up and only

around 20% have dedicated line. The percentage of enterprises which use wireless connections and satellites is even less comprising only about 10%.
Another issue of high importance is the dissatisfaction with the Internet and Telecommunications price and quality in general. The companies are mentioning such shortcomings as high pricing of the services, low capacities of the lines and low speed of connection.
Eighty seven percent of managers mentioned that the current state of telecommunication and Internet in particular, along with the pace of its development, is the biggest obstacle for their companies' growth. It seems that the current state of Internet and constraints for its development currently are, and could became the major obstacle for IT development in Armenia in short run, if other available new technologies would not be implemented.

5. ITI Business Problems. ITI is very weak in management and IT marketing. Despite the availability of highly skilled IT workforce and the potential for development, most of the companies in IT industry lack the very basics of IT Marketing and Management. The main marketing issues highlighted by the managers are the lack of marketing staff, unawareness about the competition, and lack of marketing plan, product marketing and advertising. They also admitted of not having separate financial department and do not develop business plans. This seriously limits the expansion and export possibilities and growth potential, confining companies' operations within the borders of Armenia.

6. Business environment. The performance of the companies largely depends on the business environment they operate in. The ITI faces comparatively fewer problems than other industries of the economy. The very dynamic nature of the industry calls for more flexibility and freedom. Unfortunately, the state authorities considerably impede the operations of the enterprises. The sub-chapter details the opinions of the companies' managers on encountered problems, obstacles in terms of the norms and administrative barriers, as well as their proposals on the improvement of the situation.

7. ITI Capital Market Formation Potential. One of the major problems of the IT enterprises is the lack of financial resources. Recently adopted norms on Joint Stock Companies force the companies to re-register as LLC. The issue is discussed in detail in this sub-chapter.

8. **IT Associations.** Some industry representatives have begun to join their efforts to form lobbying instruments through associations and unions to develop and expand pressing activities to compel the Government to remove obstacles. However, that process is still in its infancy stage and needs time, mobilization of resources and technical support to become active in the field. In accordance with the survey 53% of the companies expressed willingness to join an association/union.

9. Physical Assets. Managers claim that equipment and office rent prices are too high and this affects their operations. Here we could see not reasonable distribution of facilities and resources among IT enterprises. While majority of the private and most successful companies are seeking ways to alleviate their problems with regard to renting of working spaces and acquisition of equipment, the IT Hardware sub-sector occupies enormous amounts of working space at the same time operating at an extremely low level without any tangible perspectives for the development. The noticeable disequilibria is among IT educational institutions as well where the state institutions (which comprise 27 % of the sub-sector and employ 65% of instructors possess almost 85% of the PC's in the sub-sector.

10. Training Needs. The survey has proved the urgent needs for IT Marketing and Management training. More than half of the ITI companies admitted that they have problems in these fields. The survey revealed that most of the managers deal with marketing issues on a day-to-day basis, and are less concerned about long-term and strategic planning.
The third part of the companies provides on-the-job training and 40% of the surveyed enterprises support commercial training. Sales / Distribution Strategies / Promotional Strategies, Price Calculation / Determination, Market Research / Segmentation are prioritized for IT Marketing trainings and Organizational Development, Financial Management, Human Resource Management / Organizational Behavior, Planning of Company Resources / Managerial Economics for Management trainings.

The managers have started to comprehend the paramount importance of IT Marketing skills, which is one of the main pillars for successful business operations.
Another point of concern is the technical training required for IT instructors in IT Educational institutions, in order to keep their expertise up-to-date and sustain the competitiveness of Armenian IT workforce. Starting from 1961, the education system has supplied over 13,000 specialists i.e. computer programmers, computer scientists/engineers, system analysts and IT hardware specialists and if considered from 1985 – 8,300. Some 4,700 professionals are currently employed. The rest of them, about 7,000 would need re-training to keep their skills up-to-date.

11. ITI Market Development Potential. Unfortunately ITI market development is not very strong but at least it's promising. The survey clearly indicates that Armenia possesses considerable potential for IT development. Partly this is the knowledge base inherited from the former USSR, worldwide market demand for IT and of course, the will of Armenian companies to further develop their businesses. Among the advantages of local companies are the availability of inexpensive and at the time highly qualified workforce, Diaspora networks and experience in export activities. Thus, 63% of software enterprises export their software products abroad, mostly to USA. The companies also indicated willingness to be involved in such activities as Technology Transfer, Joint R&D, Marketing expertise and Market access.

Conclusions and Recommendations

As proves the information obtained from the survey, even with unfavorable business environment and current infrastructure (telecommunications, particularly related to Internet) constraints, the Armenian IT industry performs relatively not bad growth. Two factors contribute to such performance: first of all, the ICT growing dynamics in the world with some impact on IT industry in Armenia and inherited potential and current willingness of Armenian emerging IT industry and its workforce to find its own niche in the worldwide development.
The problems are grouped into four major obstacles adversely affecting IT industry development in Armenia i.e.

- some issues of regulatory framework, deficiency in its implementation and enforcement and its administration,
- infrastructure problems – poor telecommunications, mostly Internet infrastructure, with high prices, low capacities and speed, poor quality of connection, low level of security and service,
- lack of alternative Military Service, which is worse than brain drain of young IT specialists and weakens strategic development of IT firms,
- IT Education and re-training problems.

At the same time there are trends that could be considered as a promising potential for ITI development in Armenia, such as the slow, but growing number of exporting IT companies, mostly software, also the noticeable expansion trends of other IT companies into the field of software, growing demand for IT specialties, mostly computer programming and application use by IT and non IT companies, IT educational institutions slowly, but response to the market demand for training and retraining of IT specialists.

The survey has helped us to draw up some recommendations as with regard to:

- Regulatory framework, its enforcement and administration.
- Infrastructure problems – The government is taking actions to improve the situation, but it seems new players should enter into the negotiation process between the Government and ArmenTel in the quality of intermediaries in order to make the talks more effective. UITE expresses its readiness to accept this position.
- Lack of alternative Military Service - An intensive consultations are under way among the Parliament, the Government, the industry, political parties, NGOs and general public in working out mechanisms for introduction of alternative military service in Armenia within coming three years time as one of the requirements of the membership to the Council of Europe.
- IT Education and re-training problems - The recommendation we would like to bring here is to prioritize the management and marketing training for operating companies top-level management and re-training of current workforce. Although USAID and the World Bank have included components on improvement of management issues in their programs and the Eurasia Foundation has initiated the program on development and establishment of the certified center on re-training of

current workforce we would like again to prioritize issues on strengthening of management and marketing skills of operating IT companies managers and marketing staff and introduce more support re-training programs for unemployed IT workforce.

CHAPTER II. ICT DEVELOPMENT IN THE WORLD AND ARMENIA'S OPPORTUNITY

The global market size for IT products in 1996 was estimated at $1,188,14 billion and it is expected to extend by 12-15% per year and is projected to reach to total $1,815.5 billion by the year 2000, which according to estimation will account for 4.7-5.0% of the world GDP[1]. According to WB it is estimated that information added in manufacturing products will account for 60% of world GDP in 2000.

The main market driver for developing and expanding this market is computer hardware and IT services (software and services). The portion of IT services in that market will be valued 25% ($450,85 billion) in the year 2000, with computer hardware it will valued $936.75 billion, taking almost half - 49% of the world IT market.

The international trade in IT products exceeds the combined world trade in agriculture, automobiles and textiles. Global exports of IT products in 1997 amounted $681 billion and imports $618 billion. The countries/areas that accounted for over 90% of both export and imports during 1997 are the following (in descending order): USA, Japan, European Union, Singapore, Malaysia, Republic of Korea, China, Thailand, Canada, Hong Kong (China) It should be noted that both Singapore and Hong Kong (China) are important regional trade hubs and their imports and exports reflect this rather then the strength of their manufacturing industries or consumer demand in their respective countries.

The global market for IT is rapidly expanding. The market for IT services has had an average annual growth rate of 8% over the last decade, creating many opportunities for firms in developing countries. There are a number of global market drivers, which are currently influencing the growth rates of international trade in IT services in many developing and transition countries. The most significant are:

Globalization;
Global skills shortages and outsourcing;
Business re-engineering and enterprise resources planning as firms try to enhance their business competitive advantage factor;
The Year 2000 (Millennium or Y2K) problem;
European Economic and Monetary Union;
The merging of telecommunications and computing, which has resulted in the rapid growth of the Internet.

For Armenian ITI development it is important to take into account the global skills shortages and outsourcing as the main driving force.

The rapid development of IT and its impact on every sector of economy is making IT industry the very basic (as energy sector) industry for any developing economy. It is taking strategic importance in narrow meaning as the defense infrastructure and in broader, as the main tool to strengthen country's economy and increase its competitiveness in the international market.

This industry is the most perspective sector, which could play a leading role in the country's long-term economic development and have a great impact on other sectors of economy. Information Technology and its infrastructure are crucial for any country to operate successfully in the global marketplace. In addition to the fact that IT industry's infrastructure is absolutely necessary for all other industries development, all components of IT serve as a magnet for investment, both domestic and foreign. Thus, IT industry development is considered to play three-fold role in Armenian economic development: As the prosperous sector of industry itself, as a mean for other sectors development and as the infrastructure for investment. Moreover, another factor ITI development could be considered as, a tool for transforming the industrial economy into the „information economy".

The ICT sector is notable for its amazing dynamism, both in technology and market development. This sector has a huge growth potential and is therefore a valuable source of employment and economic growth in its own right. More significant, the ICT sector increasingly underpins wider economic growth and

[1] Trade in Information Technology Products and the WTO Agreements. Current situation and views of exporters in developing countries. ITC, Geneva, 1999.
[2] International Trade Center, Geneva, 1999.

competitiveness, having the potential to transform not just business model but social structures too, and in this all-pervasive influence, it is enshrined in the concept of Information Society[3].

The emergence of the global information society has in effect proven to be an instrument for increasing productivity, enhancing information, knowledge and services in many ways.

> In the business world for instance, it has fostered competitiveness, efficiency and the globalization of economy. Increasingly it has brought the means of productivity and management to public administration thereby enhancing services and responsiveness to citizens.
> For consumers, the development of the Internet and electronic commerce has led to an unprecedented increase in the choice of goods and services.
> In the educational sector, training methods have been substantially revolutionized with the advent of distance-learning and multimedia applications.
> Information Society applications will help the integration process itself by providing efficient tools services and management methods to smooth the political, administrative, social, and economic problems that the accession raises.

These are some of the many benefits the information society has brought to societies globally, which continues to take momentum.

Furthermore, the digital convergence of media and content, the pervasive penetration of the Internet and the emergence of the "digital economy" are shaping our future towards to the new "networked society".

Armenia deeply understands that it will pay the highest cost if stays away from IT development in the world. Armenia has had the in past and creates solid prerequisites nowadays to join the worldwide IT development process and utilize the obvious benefits.

Armenia was one of the most technologically developed republics of the former Soviet Union with a special emphasis on the development of IT industry. There were about 40 R&D centers acting in this field, the biggest of them, Yerevan Research Institute of Mathematical Machines had more than 10,000 employees and produced both hardware (mainframes, computers mostly for the Soviet defense industry) and software (operating systems, applications). Correspondingly the country possesses a significant number of computer programmers. Many of computer programmers worked on defense projects in the past. Since 1961 the State and the Engineering Universities of Armenia have prepared more than 13,000 ICT professionals.

The recent 10 years of instability in the region have had a negative impact on the transportation dependent and primarily export-oriented Armenian industries, but had much less influence on the local software manufacturers. After overcoming electricity supply shortages in 1991-1994 and following mass privatization, private companies– the end users – have established their businesses and the country's software sector came back on track and has accelerated its growth since 1997, especially the export oriented part of it (43% of software firms are subsidiaries of Western corporations) has attracted the highest attention. Moreover, it has boosted development of other IT industry sub-sectors that have recently emerged and have been successfully contributing to the IT industry development like Internet Services Providers, IT Services, EDP Hardware, and IT Education as well.

According to numerous studies and assessments performed by independent observers starting from 1998 (US Embassy[4], ICT[5], UNDP/UNIDO[6], UNDP/UNIDO[7], USAID[8], USAID[9], WB[10], WB[11], WB[12]),

[3] Information technologies and communication are bringing about an industrial revolution based on information, on the scale of that which rocked the 19th century. These technologies and the advances of digital electronics are now allowing the creation of new multimedia telematic services and applications which combine sound, image and text and for which all means of communication - telephone, telefax, television and computers - are used in a complementary way. The development of these new means of communication represents an element of increased competitiveness for enterprises and opens up new perspectives in terms of both work organization and job creation. The diffusion of these new technologies at all levels of economic and social life is thus gradually transforming our society into an "information society".

[4] Investment Opportunities In Software Development In Armenia. Author: Andrew Hovhannisyan, Commercial Officer, U.S. Embassy, Yerevan, May 1998

[5] Global Technology Market. Infromation Technologies. Country profile-Export Potential. ARMENIA:2000, ICT/UNCTAD/WTO, Geneva 2000

[6] Assessment Of Rationale For The Establishment Of The It Park In Armenia, Prepared by Dr. Victor Brjabrin, UNDP/UNIDO Expert, January 2000

Armenia possesses a great potential for developing a strong presence in the world's information and communication technology industry particularly in Software sector, due to former Soviet Union legacy when Armenia has been specialized in information technology (IT) and electronics.

With a population of 3 million, Armenia has an educational and cultural infrastructure, which helped to create a relatively large corps of qualified ICT professionals, mostly software developers, currently grouped within a number of small companies.

In December 2000, with the aim to boost IT industry development in Armenia, the Government announced IT industry as one of priority sectors for economic development and adopted the concept on sector development in April 2001. The majority of international donor organizations have also recognized IT industry development as their support priority area and some organizations like UNDP, UNIDO, WB, USAID, Eurasia Foundation, IESC, EU and other organizations have developed and/or have been developing their support programs and projects.

More details on world trends on ICT development and Armenian economic development opportunities are presented in the Annex 2 of this Report.

[7] Information Technology and Electronic Commerce Park (ITEC-Park) Establishment, UNDP/UNIDO, Project Document, 2000.
[8] Republic of Armenia: ICT Assessment, 15 July 2000 Version, SETA, USAID
[9] Armenia IT Master Strategy Iception Report, March, 2001, USAID
[10] Armenian Software Industry, Sector Study Alexander Poghossian Vahram Stepanyan,September 2000
[11] World Bank IT Enterprise Incubator, WB, 2001
[12] Armenia: Growth Chalanges and Government Policies, Part II, Main Report, Draft, April 30, 2001.

CHAPTER III. SURVEY METHODOLOGY

To achieve the targeted objectives, the survey implementation Project Team[13] consisted of members of Development Network NGO according to subcontract with UITE has conducted *field research* to provide interviews and gather primary data from 100 Armenian enterprises operating in the following sub-sectors of the Information Technologies (IT) sector:

Packaged software;
Internet service providers;
IT education;
IT services;
EDP hardware production/assembling and trade;
IT hardware.

The Project Team has implemented the field research at three main stages:

First stage: Selection of sample enterprises
Second stage: Assistance in preparation of survey instruments
Third stage: Data gathering

3.1. Selection of Enterprises

Selection Criteria: The Project Team has used the following criteria for selecting 100 enterprises among all private and state IT enterprises currently operating in Armenia:

1. Sub-sectoral composition (based on the main type of the company activities);
2. Duration of operations, i.e. present at least or for more than one year in the market;
3. Size of company, i.e. small and medium enterprise;
4. Ownership status.

Sampling Procedures: The Project Team has used the following sampling procedures for selecting 100 enterprises:

1. *Sub-sectoral composition:* Based on the sub-sectoral priorities, the Project Team has intended to divide the sample in the following order:

   Packaged software - 65% of total Packaged software enterprises,
   Internet service providers - 60% of total Internet service providing enterprises,
   IT education - 65% of IT education enterprises,
   IT services - 65% of total IT services providing enterprises,
   EDP hardware production/assembling and trade - 45% of total EDP hardware production/assembling and trade enterprises,
   IT hardware - 30% of total IT hardware enterprises.

   The total number of IT enterprises included in the sample should total to 100.

   The Project Team has *randomly* selected 100 sample companies among the list of each sub-sector of enterprises identified as IT companies. The list of preliminary selected companies could be presented upon request.

[13] Methodology, sampling and interviews implementation report submitted by UITE subcontractor Development Network NGO.

Due to the high rate of rejections among the companies belonging to *IT hardware* sector, the Project Team, after consultations with the client, Union of Information Technology Enterprises, has decided to redistribute the enterprises chosen for this sub-sector between other sub-sectors of Information Technologies sector. As a result, the Project Team has provided the actual distribution of the IT enterprises in the following order:

Packaged software - *26* out of 38 enterprises (68.4% of total packaged software enterprises and 26% of the sample of 100 IT enterprises)
Internet service providers (ISP) - *9* out of 11 enterprises (81.8% of total Internet service providing enterprises and 9% of the sample)
IT education - *18* out of 24 enterprises (75% of IT education enterprises and 18% of the sample)
IT services - *26* out of 35 enterprises (74.3% of total IT services providing enterprises and 26% of the sample)
EDP hardware production/assembling and trade - *14* out of 29 enterprises (48.3% of total EDP hardware enterprises and 14% of the sample)
IT hardware - *7* out of 55 enterprises (12.7% of total IT hardware enterprises and 7% of the sample).

The full list of surveyed enterprises could be presented upon request.

2. *Duration of Operations:* Based on the duration of operations, the Project Team has intended to include in the sample enterprises operating at least a year or for more than one year in the IT sector of Armenia.

3. *Size of company:* Based on the company's size, the Project Team has intended to include in the sample a minimum of 30% small (20 or fewer employees) and 30% of medium (21 – 100 employees) companies. The total number of small and medium enterprises should amount to 100.

4. *Ownership:* Based on the ownership status, the Project Team has intended to include in the sample a minimum of 5% of IT enterprises with majority foreign control.

3.2. Assistance in preparation of the Survey Instruments (Questionnaire)

The Project Team has assisted the Union of Information Technology Enterprises and the Center of Policy Analysis of the American University of Armenia during the development of the main survey instruments (questionnaires) for each IT sub-sector identified above, in several steps starting from October 2000.

The draft questionnaires for each sub-sector in English and their translation in Armenian (which were checked by CPA team), proposed by the Project Team were forwarded to UITE and could be presented upon request. The Project Team members have participated to the brainstorming sessions organized by the UITE together with the IESC consultants. As a result of this discussions the final version of the survey instruments for all sub-sectors have been developed.

3.3. Data Gathering, Processing and Analysis

The Project Team members (field coordinators) have called each private and state IT enterprise, pre-selected for interviewing, explained the purpose and use of the survey, and made appointment with the high-level manager of the enterprise for an in depth, face-to-face interview. Then, other Project Team members (interviewers), in some cases together with the field coordinator, have visited the enterprise and conducted personal interview, on a previously arranged time and schedule. Overall monitoring by CPA team Coordinator was implemented during pilot and complete field interviews.

As agreed with the Union of Information Technology Enterprises, the completed questionnaires in Armenian have been submitted to the responsible persons from the Center of Policy Analysis of the American University of Armenia for data inputting and consequent processing.

Due to difficulties to arrange meetings with managers of IT enterprises, the survey took longer time than was anticipated. It began at the beginning of December 2000 and was completed at the end of January 2001.

Inputted and processed by statistical SPSS software data were presented by CPA to UITE in form of tables, which helped in analysis of those data. Moreover, CPA kindly agreed and during the whole process of data analysis upon UITE requests processed more cross-sections data and presented more tables, which were extremely helpful for final analysis.

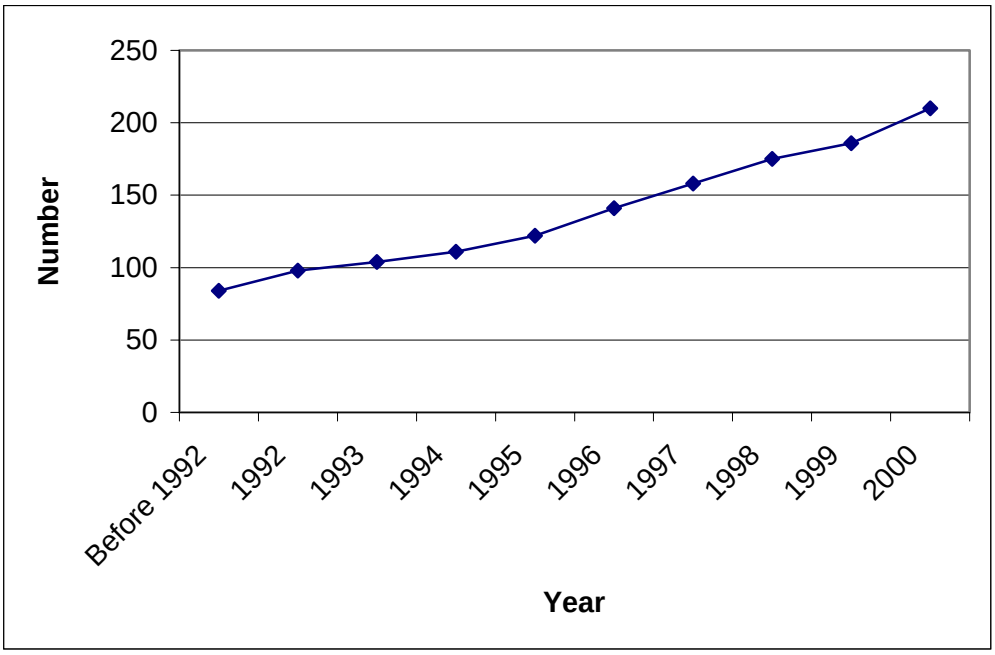
The analysis of survey data caused many questions and identified some lack of information that would be helpful for analysis. Due to that shortages UITE staff arranged mini phone surveys and gathered necessary data for comparative analysis. All mini phone surveys data analysis presented in this report.

CHAPTER IV. FINDINGS AND ANALYSIS OF ITI DEVELOPMENT TRENDS

4.1. IT Industry Development Dynamics

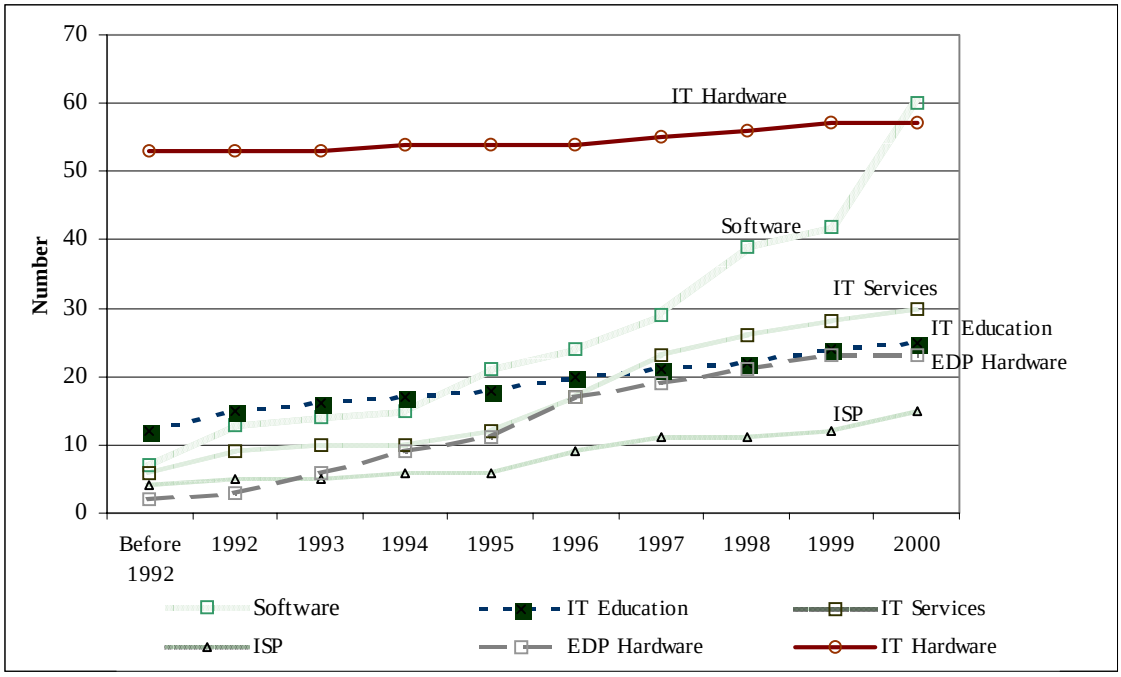
Below we present the dynamics of IT companies' establishment (cumulative) for all 222 IT companies active in the field, up to March 2001.

Graph 4.1.1. Dynamics of IT Companies Establishment



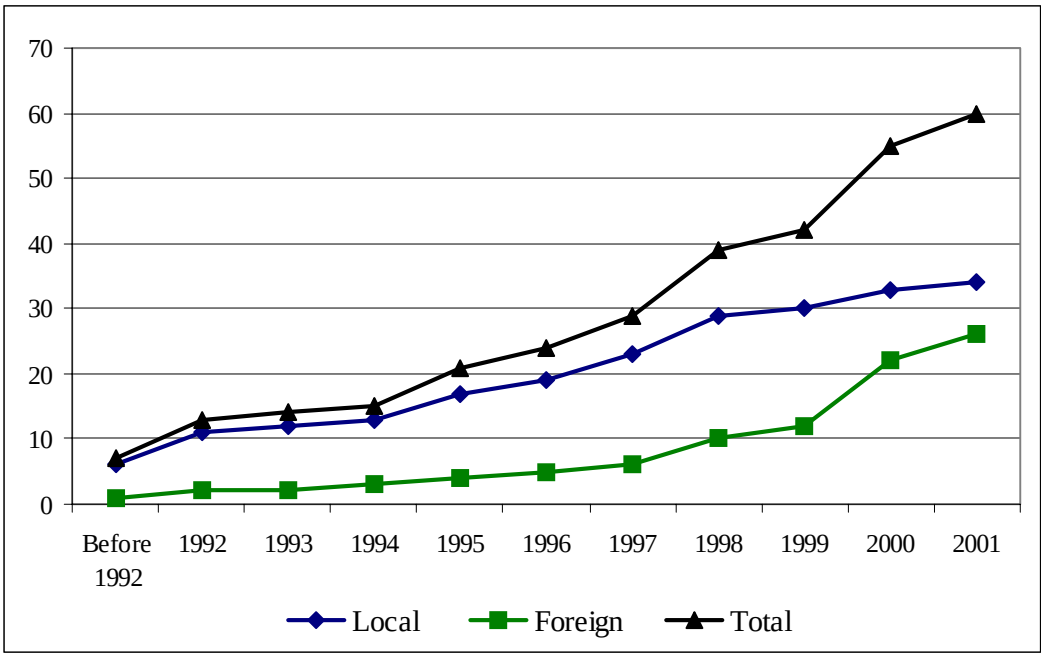
It is worth to mention that 83% of all companies are private, and 63% are established after 1992. The number of ITI companies has grown for about 270% for the period from 1992 – 2001.

Graph 4.1.2. Cumulative Dynamics of IT Companies Establishment by Sub-Sectors



The number of companies for the whole IT sector is growing, but the most rapid growth performs the Software sub-sector. The following graph presents sub-sectors cumulative dynamics in more detail.

Graph 4.1.3. Cumulative Dynamics of Software Companies Establishment



This growth indicates that eventually the potential capacities of Armenian software industry and SW developers talent has been increasingly utilized by both foreign and local SW companies.
Moreover, in addition to 60 companies which operate in the Software sub-sector and develop software as a basic product, there are 25 non-software companies among 74 surveyed (100 minus 26 SW), which stated that they developed software as a secondary product and some of the companies even exported them. These 25 companies are mainly comprised from IT Education institutions i.e. about 35 %, IT Services - around 25%, about 25% are ISP companies and some 15% are EDP Hardware companies.
This has driven the number of companies engaged in SW development up to least 85 enterprises. In view of this rather interesting fact we could assume that the number of non-software companies involved in the development and export of software products (as their non-basic product) might increase by additional 10-15 companies if we consider the companies not covered by the survey.
Among the presented 60 SW companies, 26 are subsidiaries of foreign IT enterprises. They can be broken down into 23 USA based companies, one company with the headquarters in the UK, one in Belgium and one in France. All of these enterprises have recognized the potential and the talent of Armenian SW developers and have successfully been utilizing it so far.

Another interesting fact is that, the foreign companies gradually take more interest in other IT sub-sectors in Armenia. For example, a company based in Israel sells educational multimedia courses in Armenian market and provides post sail and training services. Other foreign companies are engaged in EDP Hardware assembling and selling and Internet Service Provision.

Highly dynamic are also the IT Education sub-sector (detailed treatment is provided in the sub-chapter No.4.3) and IT Services sub-sector. The growth of the latter could be explained by the increasing demand for IT Services and an increasing specialization of labor in the IT industry and in the economy of Armenia as a whole. More and more firms in all sectors of economy prefer outsourcing to or subcontracting of IT Services companies for the implementation of IT components of their projects.
IT Services companies also offer services as information collection, processing and dissemination services, IT Professional Services, Intranet and Network services, hardware maintenance and support services.

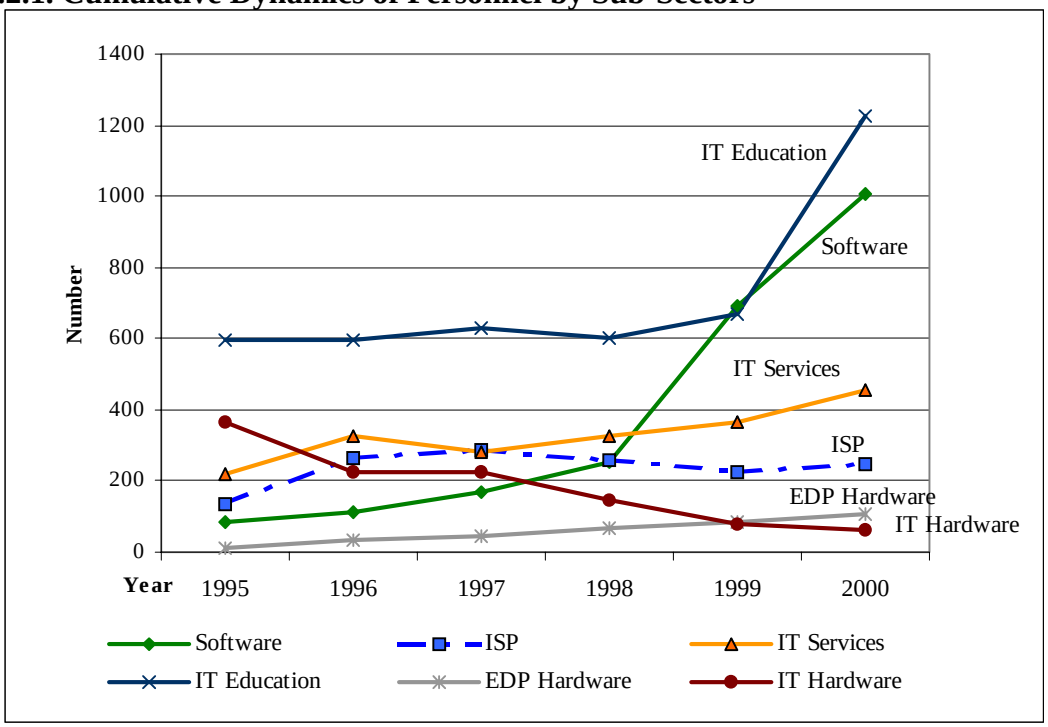
4.2.

4.3. ITI Current Workforce, its Dynamics and Migration and Workforce Need

4.2.1. WORKFORCE DYNAMICS

Armenia was one of the most technologically developed republics of the former Soviet Union with a special emphasis on the development of Information and Communication Technology (ICT) industry. There were about 40 R&D centers acting in this field, the biggest of them, Yerevan Research Institute of Mathematical Machines employed more than 10,000 employees and produced both hardware (mainframes, computers for the Soviet defense industry) and software (operating systems, applications). Correspondingly the country possesses a significant number of computer programmers. Most of them are graduates from the Yerevan State University and the State Engineering University of Armenia.
Thanks to the development of IT Industry in Armenia, once being one of the most advanced republics in the former Soviet Union what regards specialists in the fields of electronics and information, Armenia has got the second chance to develop and fully utilize available human resources, and based on the current facilities, train and educate new professionals in the field of IT.
Following to the dynamics of IT companies establishment provided in previous sub-chapter the Graph 4.2.1. shows the dynamics of Armenian IT engaged workforce from 1995 to 2000.

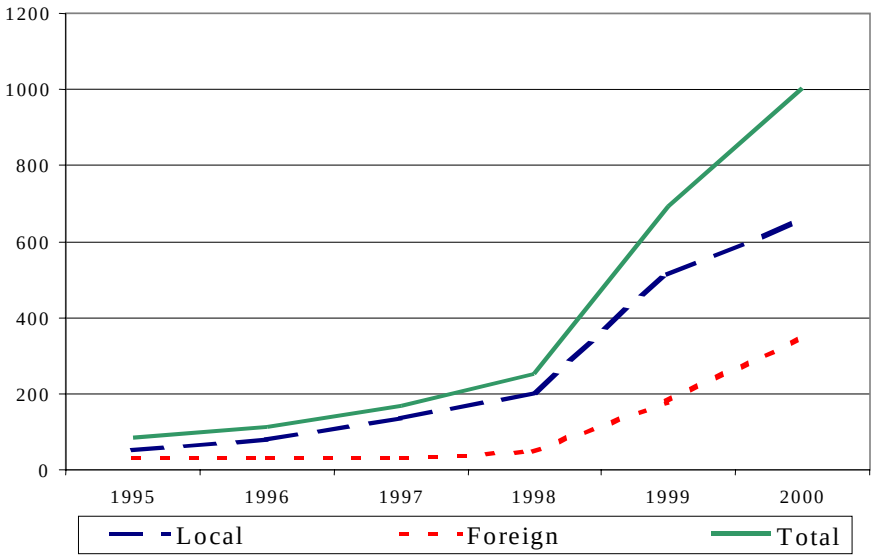
Graph 4.2.1. Cumulative Dynamics of Personnel by Sub-Sectors



The curves above go in line with the companies' establishment dynamics (graph 4.1.2.) and truly indicate the rapid growth of demand for IT skills, more specifically, the increasing number of employees in software companies and growing personnel in IT Education sub-sector.

It is worth to bring the difference of staff growth between foreign and local software companies in graph 4.2.2. Thus, the growth rate of personnel in software sub-sector has reach the annual average of 60%, and the number of staff in IT Education institutions has doubled during the last five years.

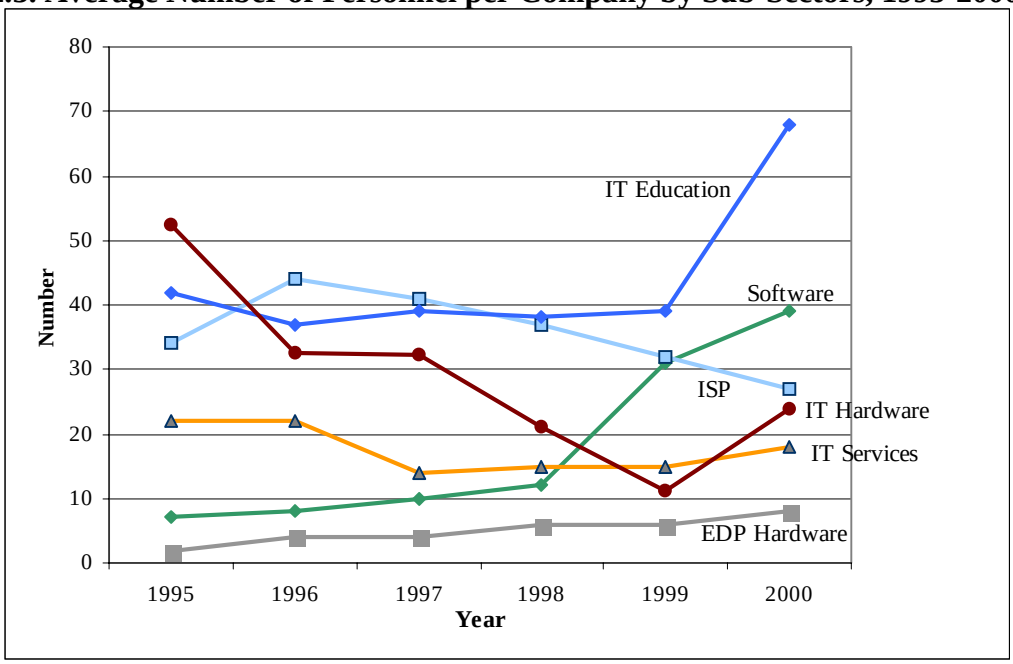
Graph 4.2.2. Cumulative Growth of Staff Differentiated Between Local and Foreign Software Companies



It should be noted, that although local companies account for more staff than foreign companies do, the number of IT specialists in foreign companies exceeds the number of IT specialists in Armenian companies. This fact is well understood when we consider the composition of the workforce. Thus, the local companies keep relatively large administrative and support personnel while the foreign companies are concentrating more IT specialists and have less administration while whole marketing staff located at the headquarters abroad.

Other IT sub-sectors such as IT Services and EDP Hardware are mostly serving local market and due to this, their growth rate is constrained by the size of local demand. The Internet Service Providers have not shown a considerable progress due to the constraints explained in the chapters that follow.
IT Hardware sub-sector is losing its staff due to lack of orders and projects.

Graph 4.2.3. Average Number of Personnel per Company by Sub-Sectors, 1995-2000

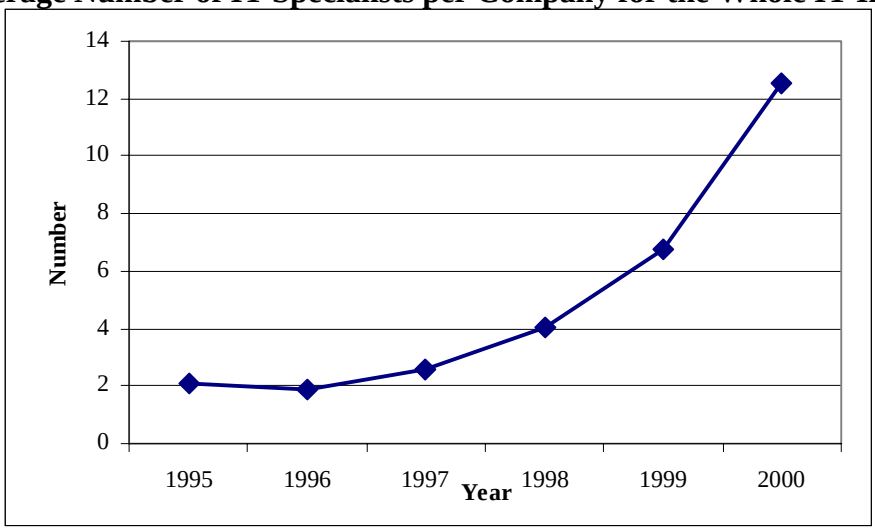


Note: In IT Hardware sub-sector only 1 company out of 7 surveyed provided information on the number of personnel. So it will be difficult to discover any trends in this sub-sector.

The graph 4.2.3 shows the average number of personnel per company. This graph indicates the expansion of some of the IT sub-sectors. The expansion of software companies is reflected in increasing average number of personnel per company. It resulted in the growing demand for IT skills and export of products by companies and was responded to by IT Education institutions.

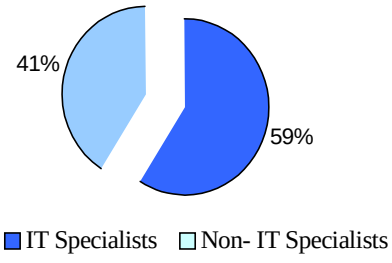
Graph 4.2.4. reflects the persistent growth and specialization of labor in the companies. The average number of specialists in the IT enterprises (as per 100 surveyed companies) has increased more than six fold for the last 5 years.

Graph 4.2.4. Average Number of IT Specialists per Company for the Whole IT Industry

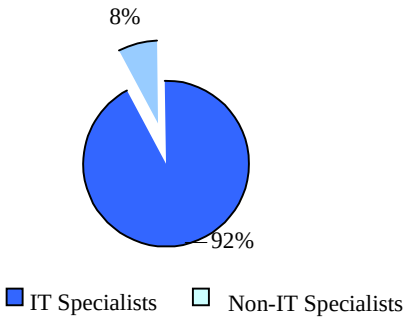


It is worthwhile to present separately the software sub-sector, especially the differences in staff distribution between local and foreign companies (graphs 4.2.5. and graph 4.2.6.).

Graph 4.2.5. Staff Distribution Between IT Specialists and Non IT Specialists for Local Software Companies

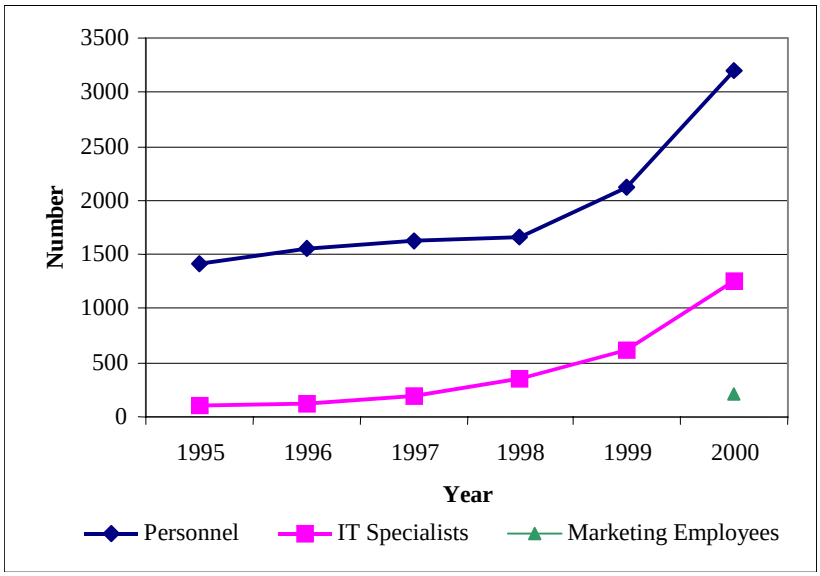


Graph 4.2.6. Staff Distribution Between IT Specialists and Non IT Specialists for Foreign Software Companies



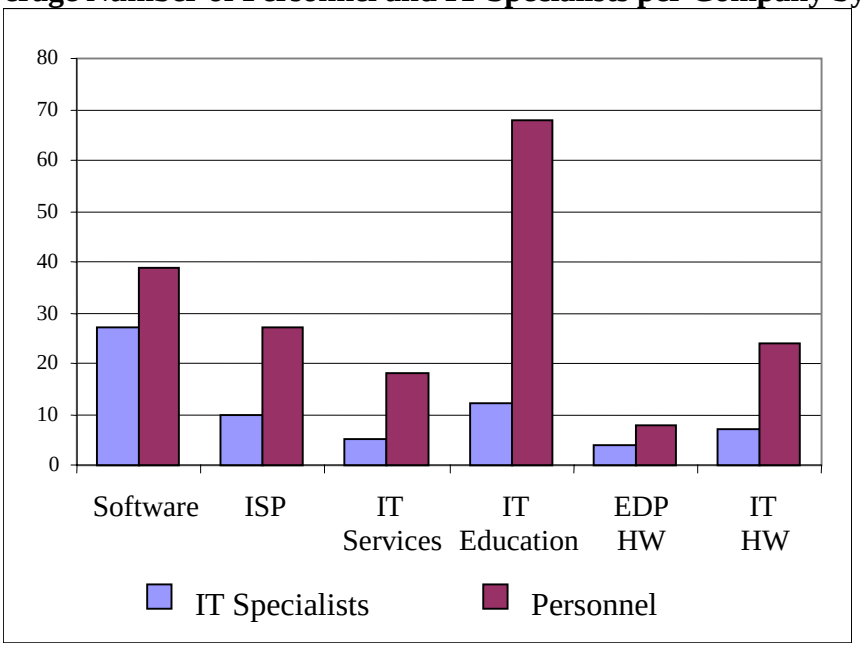
The weakness of the whole Armenian economy in marketing focused us on identifying these problems within IT industry. In this sub-chapter we tried to find out the marketing capabilities of companies. Graph 4.2.7. presents growth of the number of personnel and IT specialists for 100 surveyed companies. Unfortunately, we could obtain the figure for marketing staff only for year of 2000.

Graph 4.2.7. Dynamics of Personnel, IT and Marketing Specialists for the Surveyed Companies



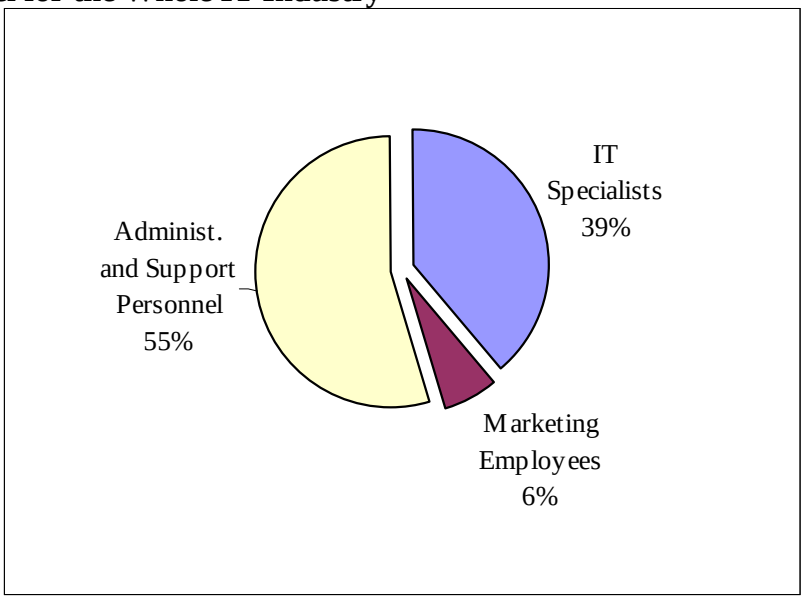
The curve for personnel of graph 4.2.7. includes IT Specialists as well as marketing employees.

Graph 4.2.8. Average Number of Personnel and IT Specialists per Company by Sub-Sectors

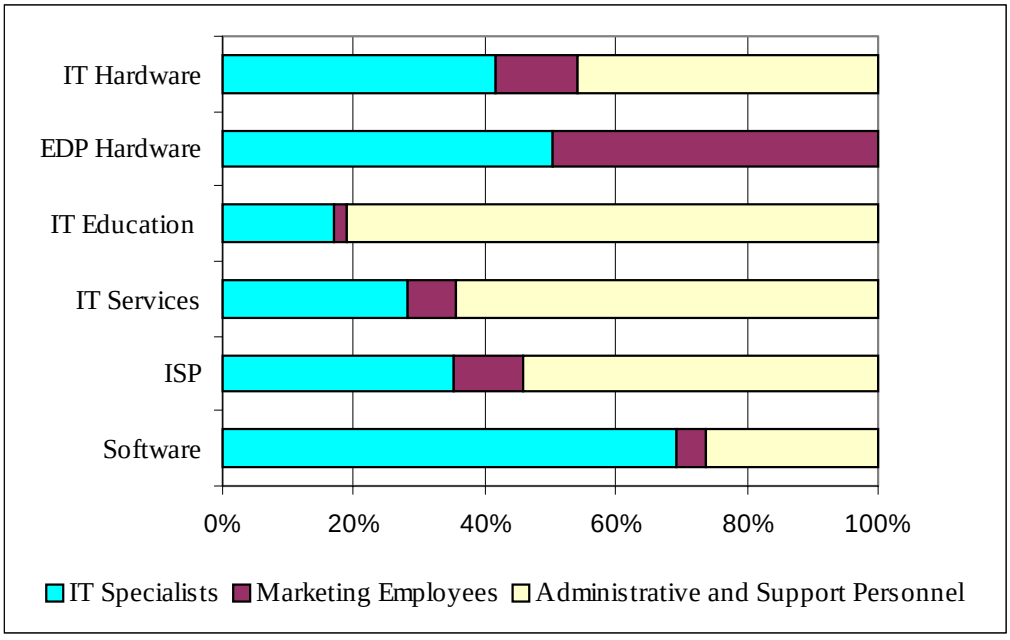


As it is seen from the graph 4.2.8. the software sector has the minimal ratio between Personnel and IT specialists.

Graph 4.2.9. Ratio Between IT Specialists, Marketing Employees and Administrative and Support Personnel for the Whole IT Industry



Graph 4.2.10. Ratio Between Total Number of Personnel, IT Specialists, and Marketing Employees for the Sub-sectors



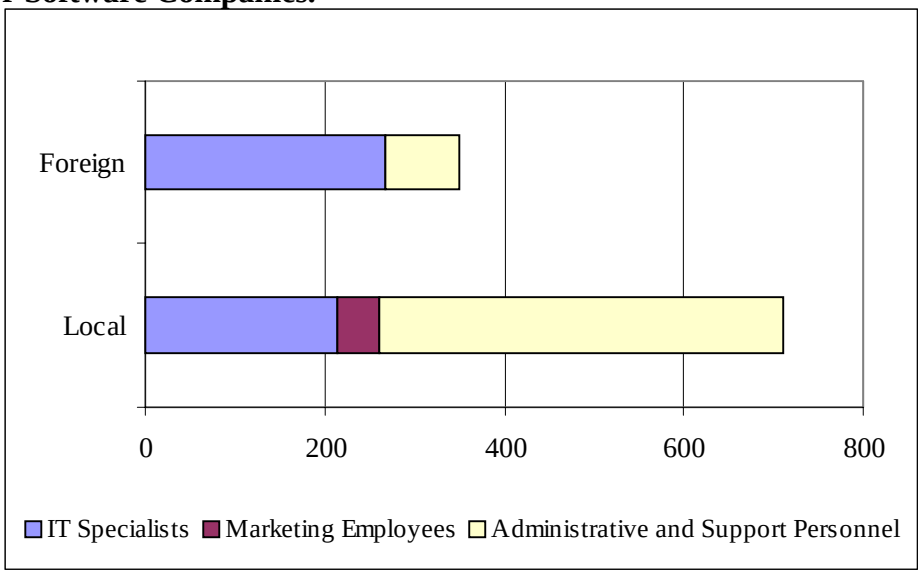
EDP Hardware reported to have 50/50 ratio between the IT specialists and marketing employees, which is the highest among IT industry sub-sectors. ISP also accounted for employing some 10% of marketing specialists from the total number of their staff.

IT Education and IT Services lack marketing staff and as a consequence experience problems in the corresponding fields.

Though the ratio is comparatively high in IT Hardware sub-sector, nevertheless, the stagnation trends identified in this sector show the low qualification of their marketing specialists and inability to go in line with market demand.

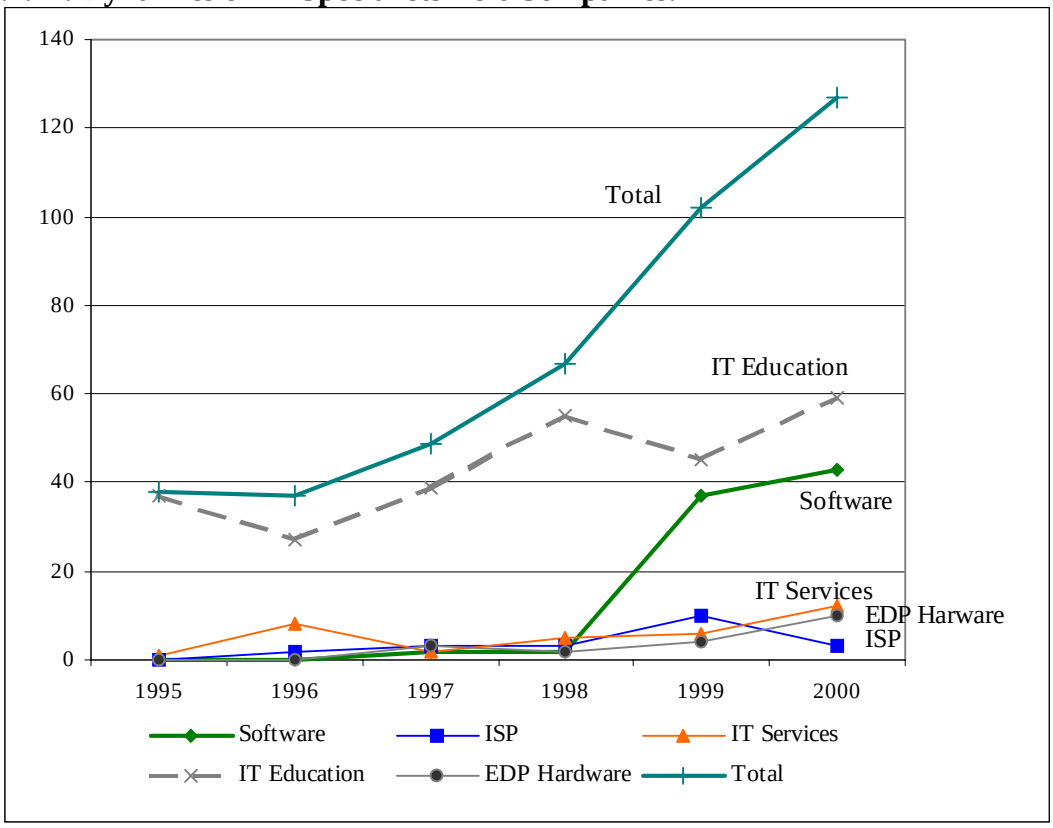
The Graph 4.2.11. shows that the marketing staff in software sub-sector can only be attributed to local companies, as the marketing departments of foreign companies are generally located at their headquarters abroad.

Graph 4.2.11. Ratio Between Total Number of Personnel, IT Specialists, and Marketing Employees for Software Companies.



4.2.2. SPECIALISTS' MIGRATION AND BRAIN DRAIN

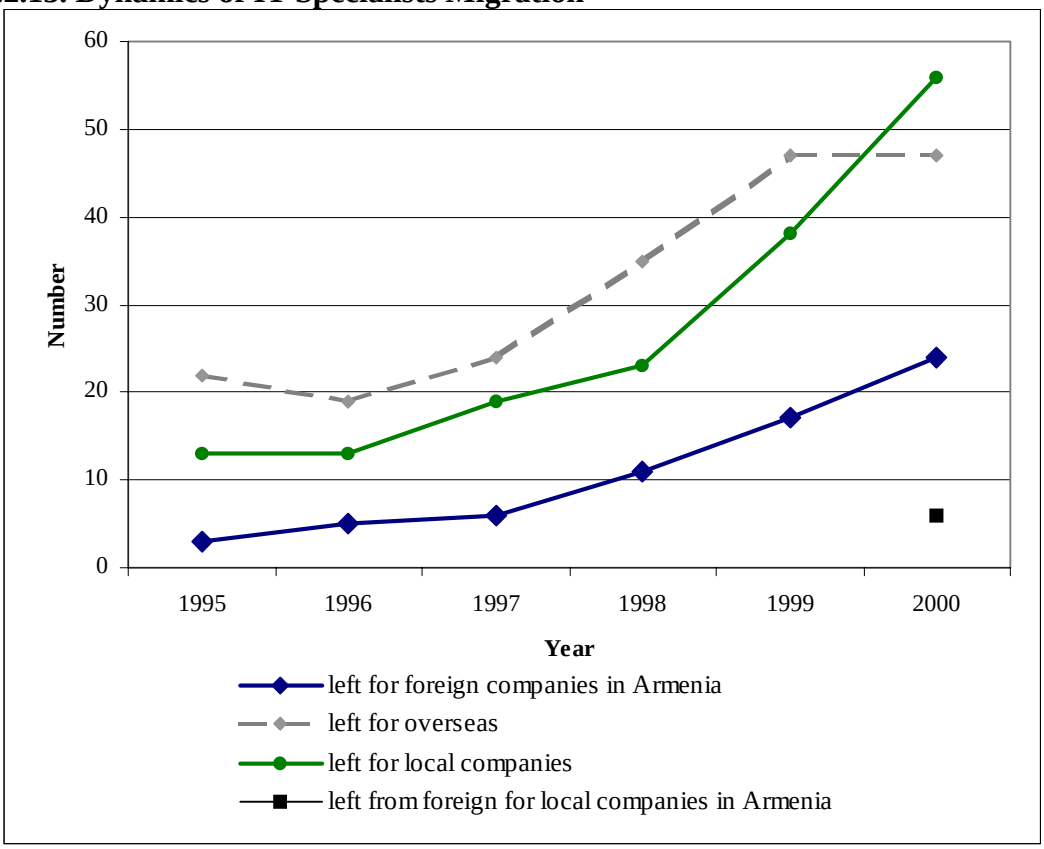
Graph 4.2.12. Dynamics of IT Specialists Left Companies.



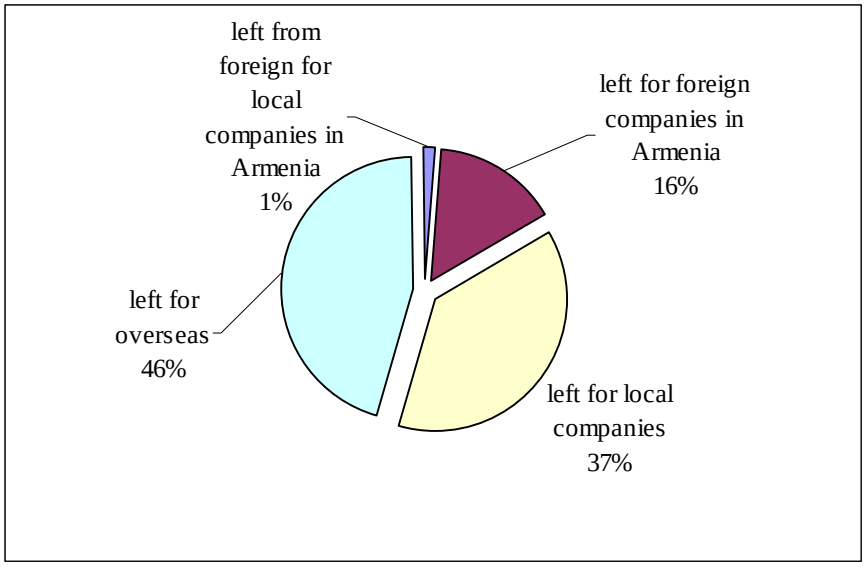
The high rates staff rotation (especially in software sub-sector) indicates that more employment options and alternatives are available in the IT market for labor. No migration was reported by IT Hardware sector, which is not a surprise taking into consideration the stagnation in the sector.

The following graphs 4.2.13. and 4.2.14. present IT specialists migration within Armenia and overseas.

Graph 4.2.13. Dynamics of IT Specialists Migration



Graph 4.2.14. Ratio Between IT Specialists Who Left Armenia and Stayed in Armenia (1995-2000)



The analysis on the behavior of emigrants says that the behavior can be divided into three stages[14]: „Sending back remittances to their families in the homeland is the first phase. The second phase starts after the

[14] Diasporas, Remittances and Homeland Development .Text of the presentation at the ILO Workshop on "Making the Best of Globalization: Migrant Workers Remittances and Micro-Finance", November 20-21, 2000 in Geneva, Switzerland.By Shahid Javed Burki . Until July 1999, Shahid Javed Burki was Vice President of Latin America and the Caribbean at the World Bank. After having been in the Bank for 25 years, he set up a new consulting company and became its Chief Executive Officer. The consulting company - EW-Financial Advisors, LLC - is an affiliate of the Emerging Markets Partnership.

Diasporas have established themselves in the host countries. At this stage, significant economic assets are at the command of the members of the Diasporas. These assets are used along with current incomes, for making long term investments in the home country if conditions permit. During the third phase the Diaspora associations practise benevolent activities which are done mostly implemented through non-government organizations. Diasporas tend to support the activities of the NGOs when the governments of the homeland are not strong enough".

As figures of survey indicate, there is already a development of those practices in IT field with Armenian „old" and newly formed Diaspora. The second stage creates market opportunities for export expansion and this is why we have tried to identify emigrants with possible involvement in intermediary roles. The information that follows confirms that Armenian companies have already started utilizing contacts with their former employees for marketing their companies, products and attracting orders. Surprisingly, the most active are IT emigrants from IT educational institutions. The information detailed below is based on the number of specialists who left Armenia for overseas after the year 1995 [15].

In accordance with the information obtained from reliable sources (mainly managers of companies) the main outflow of highly qualified IT professionals occurred before 1995. By the opinion of experts, 500-1000 IT professionals left Armenia before 1995, and the majority of them were Computer Programmers, Computer Scientists/Engineers and System Analysts.

Table 4.2.1. IT Specialists and Instructors who left Armenia after 1995

	Computer Programmers	Computer Scientists and Engineers	Hardware Specialists	System Analysts	IT Instructors	Total
Total Specialists Left (as per survey)	**21**	**11**	**10**	**15**	**137**	**194**
Or, expressed in %	**10.8 %**	**5.6 %**	**0.5 %**	**0.7 %**	**70.6 %**	

People in Contact	***in contact***	***bring orders***
Software	**17%**	**9%**
Internet Service Providers	**8%**	**0%**
EDP Hardware	**7%**	**33%**
IT Services	**10%**	**23%**
IT Education	**59%**	**31%**
IT Hardware	**0%**	**0%**
Total	**133**	**32**

Approx. number of people left before 1995	***≈ 500-1000***
Total (as per survey) number of people left after 1995	***194***
Total (as per survey) number of people in contact	***133***
Total (as per survey) number of people who brings orders	***32***
Percentage of people in contact (from those who left after 1995)	***68.5%***

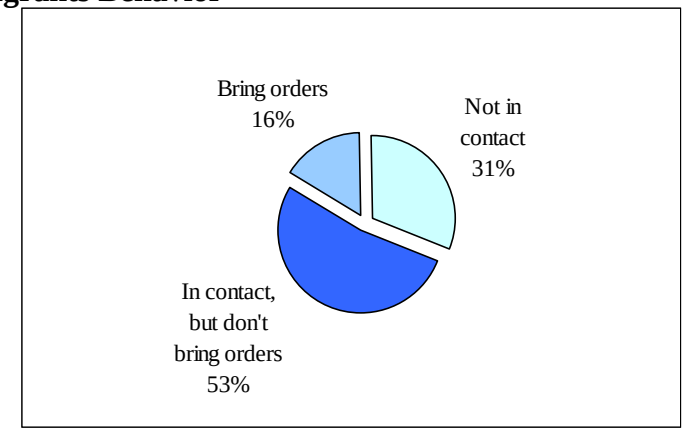
[15] This question has been included in the questionnaire as suggested by Mr. Vladimir-Goran Kreacic, World Bank Sr. Enterprise Restructuring Specialist, Private and Financial Development Sector Unit, Europe and Central Asia Region.

Percentage of people who bring orders ***16.5%***

During personal interviews we have realized that companies are not open to share information on contacts with people abroad, on mechanisms of receiving orders and outsourcing. However we have identified, that those contacts are used for informal promotion of their former employer-companies by presenting profiles, capabilities. Sometimes, those contact people are involved in the implementation brought orders and projects.
The percentage of IT specialists left for overseas comprises about 20% from the current pool of specialists as per surveyed companies.

It seems that Computer Programmers, Computer Scientists/Engineers and System Analysts who left for overseas proved the high quality of IT education in Armenia and generated demand for IT Instructors due to high world wide market demand for IT specialists.

Graph 4.2.15. IT Emigrants Behavior



4.2.3. IT INDUSTRY NEED FOR IT SPECIALISTS

The following table 4.2.2. presents distribution of specialists among IT Sub-Sectors for 100 surveyed companies.

Table 4.2.2. Employed IT Specialists in IT Industry

IT Sub-sectors	Computer Programmers	System Analysts	Computer Scientists / Engineers	Computer Hardware Specialists	IT Instructors	Total IT Specialists
Software	**602**	**56**	**106**	**62**	**0**	**826**
foreign	*378*	*18*	*39*	*3*		*438*
local	*224*	*38*	*67*	*59*		*388*
Internet Service Providers	**40**	**17**	**20**	**10**	**0**	**87**
EDP Hardware	**17**	**11**	**5**	**29**	**0**	**62**
IT Services	**45**	**18**	**34**	**32**	**0**	**129**
IT Education	**0**	**0**	**0**	**0**	**209**	**209**
IT Hardware	**0**	**0**	**0**	**70**	**0**	**70**
Total as per survey	***704***	***102***	***165***	***203***	***209***	***1,383***
Extrapolated Total For Employment	**2,100**	**250**	**450**	**800**	**250**	**3,850**

* in addition to 100 companies we have questioned another 4 software companies (2 local and 2 foreign) with the total number of specialists -130. This figure is included in the above table.

It is not surprise that the growing industry will create demand for IT specialists. The following table 4.2.3. presents the needs of 100 surveyed companies.

Table. 4.2.3. Need for Different IT Specialists by Sub-Sectors

IT Sub-sectors	Need for Computer Programmers	Need for System Analysts	Need for Computer Scientists Engineers	Need for Computer Hardware Specialists	Need for SW Instructors	Total Need for IT Specialists
Software	**116**	**5**	**210**	**11**		**342**
foreign	*105*	*0*	*205*	*6*		**316**
local	*11*	*5*	*5*	*5*		**26**
Internet Service Providers	**50**	**40**	**6**	**6**		**102**
EDP Hardware	**0**	**0**	**0**	**0**		**0**
IT Services	**14**	**7**	**3**	**12**		**36**
IT Education					**15**	**15**
IT Hardware						
Total as per survey	***180***	***52***	***219***	***29***	***15***	***495***

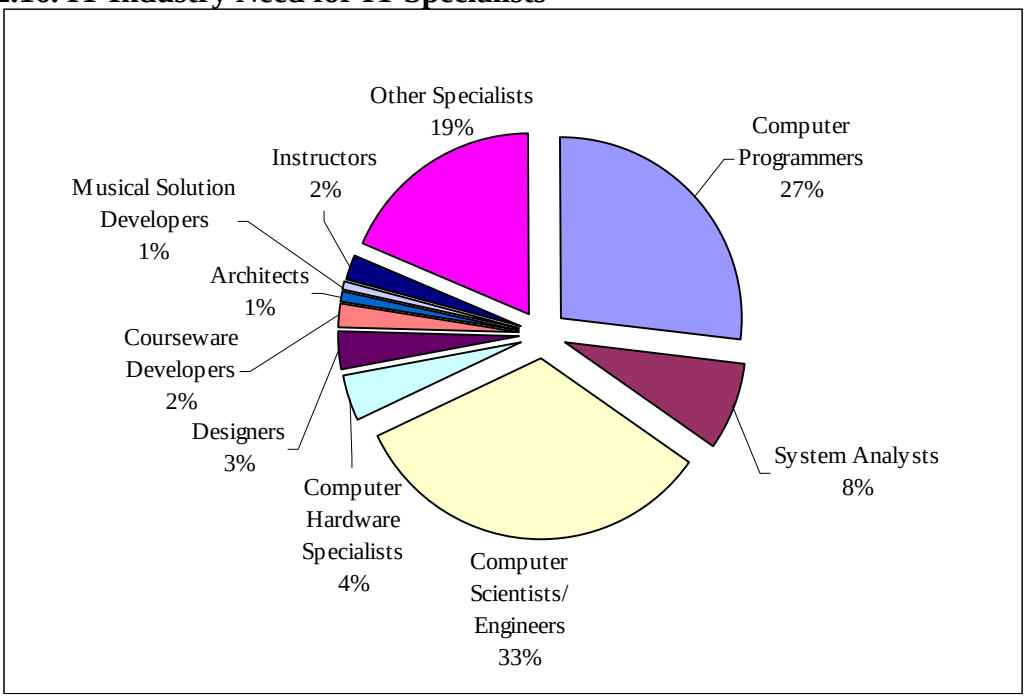
Extrapolation brought us to the approximate employment figure for CP and CS/E in SW to around 1600. Actual demand for Computer Programmers and Computer Scientist/Engineers in the Software sub-sector comprises 46% of currently employed CP and CS/E by SW firms (around 700 specialists). The demand for System Analysts on the part of Internet Service Provider sub-sector is 237% of currently employed SA by ISP sub-sector (around 17 specialists). Total need for IT specialists in IT industry is 36% of current employment pool (around 1400 IT specialists).
The other specialties in demand by the companies are brought in the table 4.2.4.

Table 4.2.4. Additional Specialists Needed

	Designers	Courseware Developers	Architects	Musical Solution Developers	IT Specialists	Total Needs
Software	**7**	**4**	**0**	**2**	**115**	**128**
ISP	**2**	**2**	**1**	**0**	**1**	**6**
IT Services	**9**	**7**	**5**	**3**	**8**	**32**
IT Education	**0**		**0**	**0**	**0**	**0**
EDP Hardware	**4**	**1**	**1**	**0**	**0**	**6**
Total as per survey	**22**	**14**	**7**	**5**	**124**	**172**

In accordance with the survey the total workforce demand for IT and ITI related specialists is 667. The demand for IT specialists and additional specialties for IT industry comprises 48% from the current (as per survey) employment pool and for the all economy sectors it is estimated to be 1800 specialists.

Graph 4.2.16. IT Industry Need for IT Specialists

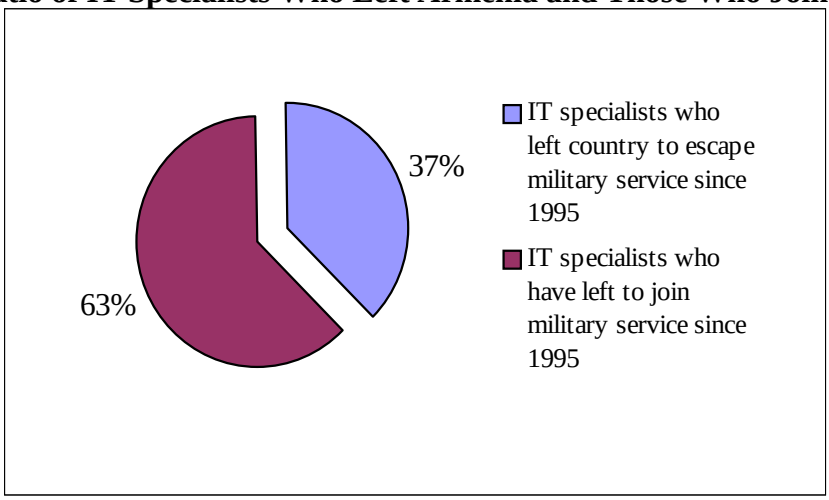


4.2.4. MILITARY SERVICE

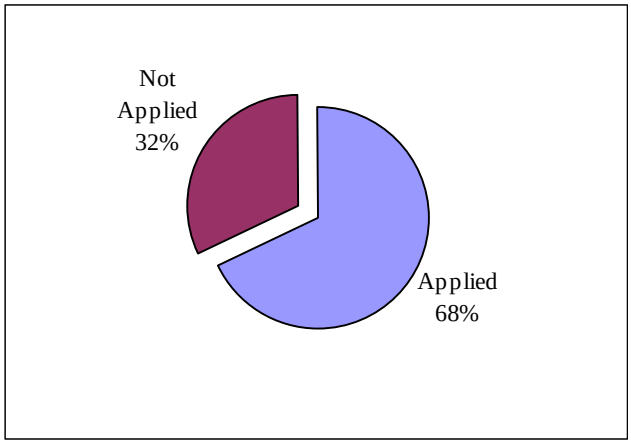
IT companies claim that the military service in Armenia seriously affects their businesses and the absence of Alternative Military Service compels many IT professionals to leave the country thus, escaping the military service. Those who serve in the army nearly lose their skills, because two years is a very long period in IT industry that is evolving rapidly and where the average circle time when new technologies, products and services are introduced in the industry is 3 to 6 months. With this part of the survey we have tried to bring some figures to evaluate the possible impact, which has the lack of Alternative Military Services on IT Industry development opportunities.

During last five years only 100 young specialists among surveyed companies have been called to Military Service. First of all this figure is rather strange. It is too low taking into consideration age distribution for the personnel in IT companies. Graph 4.2.17 shows that 37% of them left the country to escape the Military Service.

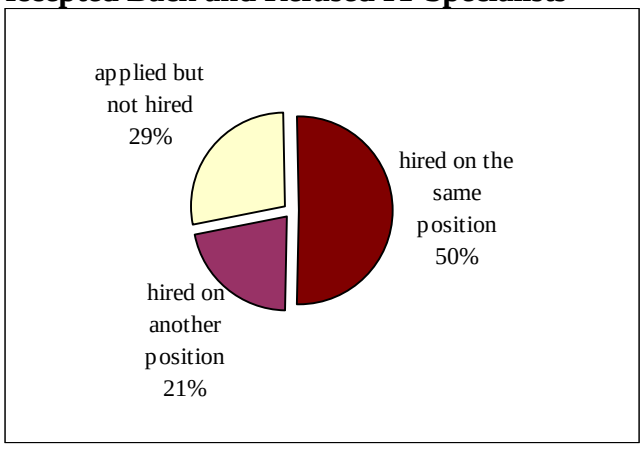
Graph 4.2.17. Ratio of IT Specialists Who Left Armenia and Those Who Joined in The Army



Graph 4.2.18. Percentage of IT Specialists Who Applied to the Same Company After Military Service

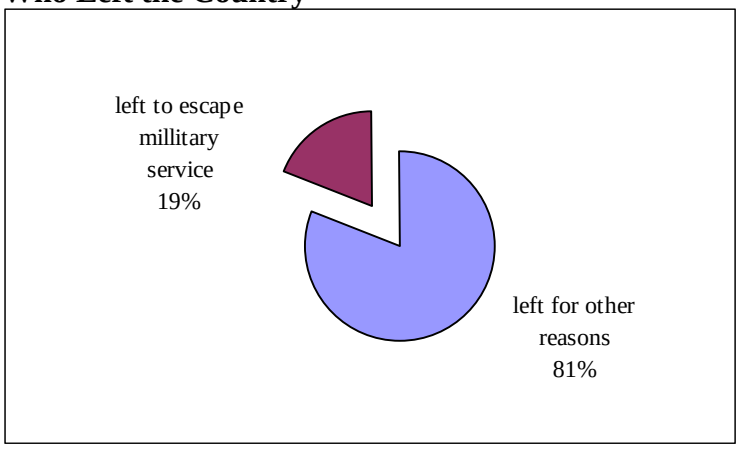


Graph 4.2.19. Ratio of Accepted Back and Refused IT Specialists



On completion of Military Service only 68% of IT Specialists applied back to the same company they worked before as the graph 4.2.18 shows, but only 71% from those who applied - have been hired back (graph 4.2.19) and only 50 % on the same position.

Graph 4.2.20. Ratio of IT Specialists who Left Country to Escape Military Service within Total IT Specialists Who Left the Country



4.3. The State of IT Education In Armenia

4.3.1. IT EDUCATIONAL INSTITUTIONS IN ARMENIA.

Currently, as a whole, there are 29 institutions in Armenia providing IT education. They can be broken down as: 6 state owned and 23 private.
They can also be classified into three groups:

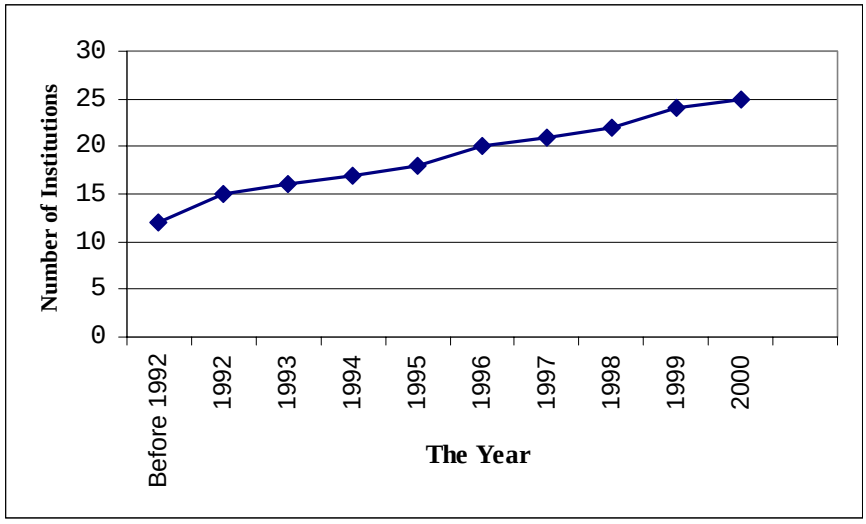
- Higher Education - There are 10 Higher Education Institutions, (4 state and 6 private).
- High Education – 4 Institutions (2 state and 2 private)
- Training and Re-Training – 15 enterprises, all of them private, are delivering short-term courses of computer programming languages and user applications.

Among 18 surveyed institutions, there are 8 Higher Education Institutions, 2 High Education Institutions and 8 Training/Re-Training Enterprises.

4.3.2. DYNAMICS OF ESTABLISHMENT

The graph 4.3.1 shows the steady growth of IT Education sector. It is worth to mention that the rate of growth can be attributed to private education sector only. For the last decade no state IT institution has been established, and the private education institutions are outpacing the state sector, being the fastest growing one, due to its abilities to adapt to market realities, thus, meeting the needs of mostly software and IT services sector.

Graph 4.3.1 Dynamics of IT Educational Institutions Establishment

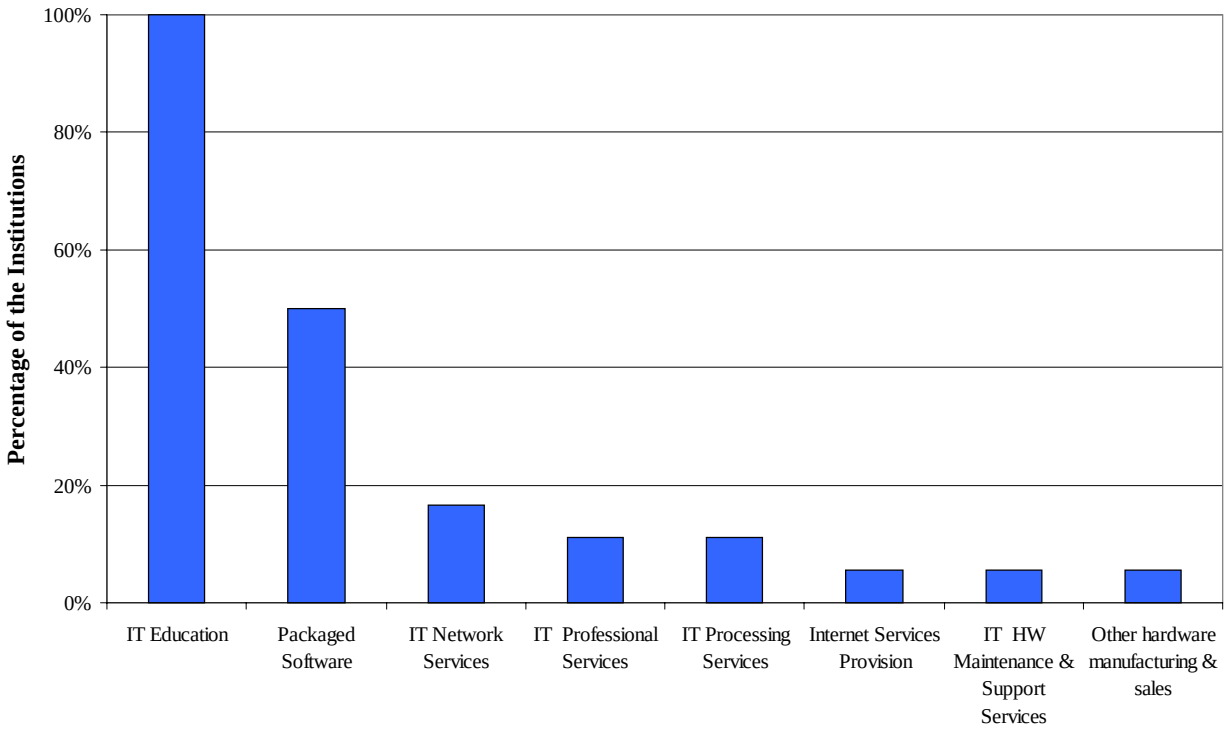


Around 60% of the institutions are accredited by the state.

4.3.3. PROFILE

Main and Sub-Activities
The graph 4.3.2 shown below indicates the fields of activities the institutions are engaged in. As it is clear from the graph, in addition to the main profile of IT Education with 100% engagement, about 50 % of the institutions are involved in the software development.

Graph 4.3.2. Main Profile and Sub-Activities of IT Educational Institutions



Specialization of the Institutions

Computer programming courses are delivered in about 60% of the institutions. And considering that 50% of institutions are involved in the development of software products we might also indicate the high level of expertise of the specialists who work in those institutions, as the instructors are not only people of the theory, but, also apply their knowledge in the real commercial world.

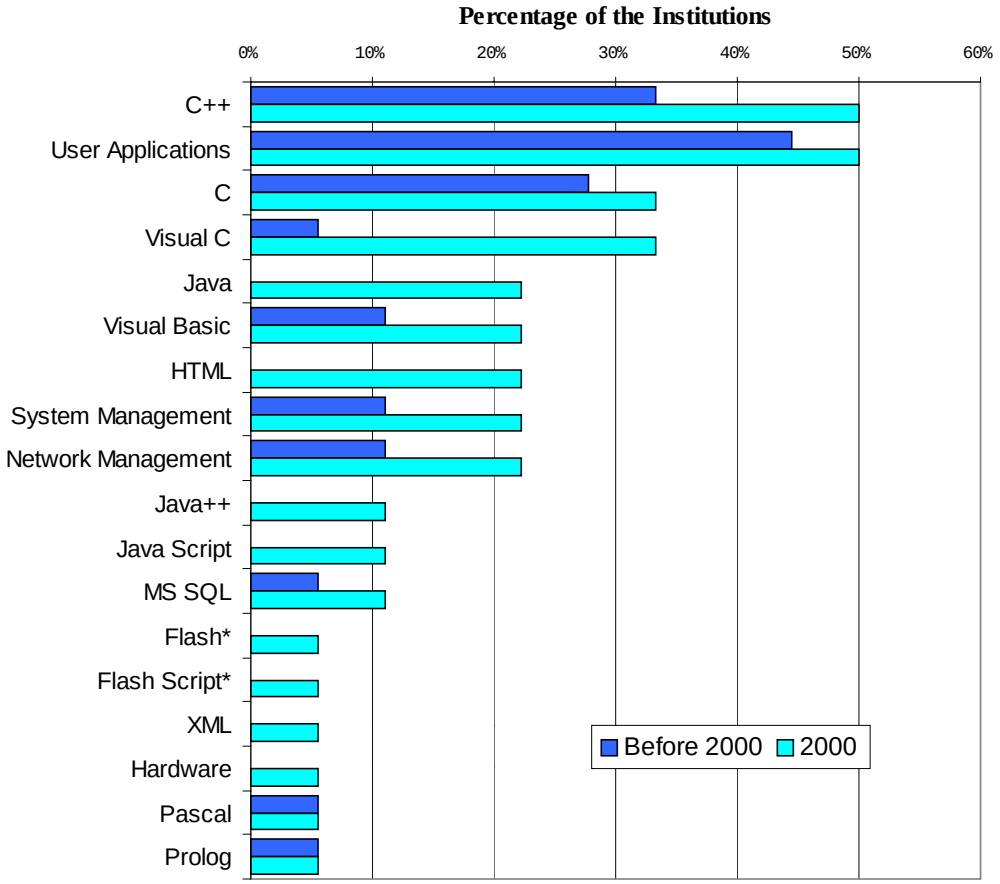
About 40% of the institutions are teaching User Applications.

4.3.4. COMPUTER PROGRAMMING LANGUAGES COURSES DELIVERED

The graph 4.3.3 shows that new 8 computer-programming languages were added to the curricula of the institutions during the year 2000. It confirms the trends for Internet development in Armenia, as almost all these languages are utilized mainly for Internet purposes.

Also, the quick adoption of new subjects speaks about relative flexibility of Armenian IT educational system, and this might be an excellent example where demand generates supply in the relatively short time, considering the realities of Armenian educational system as a whole.

Graph 4.3.3. Courses Delivered Before and During the Year 2000



Note: * Flash and Flash Script are advanced Internet applications.

For the year 2001 the enterprises plan to continue delivering all of the above-indicated courses.
In addition, the University of Management and Information Technologies has already introduced the following subjects: IT Management, IT Marketing and IT Project Management, IT Industry Policy and Internet Economy, E-commerce, E-business into the curricula.

Only 4 institutions provide on-the-job training services. The vast majority of 14 enterprises deliver trainings in the traditional classrooms.

4.3.5. GRADUATES

According to the data obtained from State Engineering University of Armenia (started from 1961) and Yerevan State University (started from 1975) these institutions has supplied the market with approximately 13,300 IT Hardware Specialists, Computer Programmers and Computer Scientists/Engineers (to date).

During the survey we also requested recently established private institutions to provide information on the number of computer programmers they have trained during the last 5 years. Some 40 % of the companies either refused directly, or evaded to answer due to „confidential nature“ of the requested information. The rest of the companies have just started delivering courses on programming and therefore, do not have graduates yet. One of the companies replied that they have had around 100 programmers prepared for the last 2 years.

4.3.6. WORKFORCE

Currently there are 209 instructors working in 15 surveyed institutions (three institutions refused to provide information on the number of instructors).
Among them, 75% of the instructors are involved in the delivery software development courses, and 25 % are teaching User Applications.

Some 65% of the Instructors are working in 27 % (or 5) State Institutions, and 35% of the instructors work in 72% (or 13) Private Institutions.

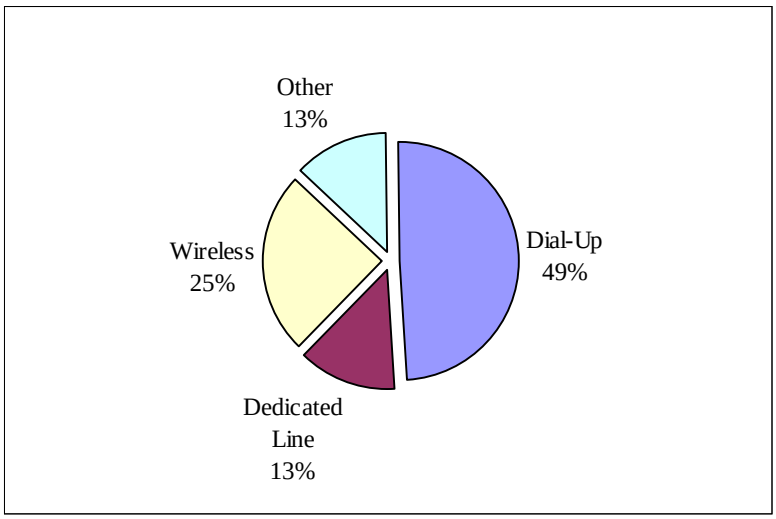
The demand for instructors is moderate, comprising only about 8% of the current instructors employment pool. In some extent it can be explained by the difficulties the institutions face on the way of development. The problems with regard to facilities, restricted classroom space and limited financial resources largely contribute to the low demand for instructors in private institutions, which is not normal when the demand for IT professionals continuous to grow at an amazing rate. At the same time there is a high demand for IT instructors' re-training. About 40% (or 5) of private institutions and 20% (or 1) of state ones support commercial training for IT instructors (as per survey). But only about 20% of all institutions would like to increase spending on the training activities in the future.

The worrying number of 137 IT instructors (as per surveyed companies), which comprises 70% of the current available employment pool of software instructors, left the country for overseas between 1995 – 2000.
Due to the fact that the educational systems around the world are not able to satisfy increasing needs for IT specialists, we witness in Armenia, so called „head hunting" process. Foreign companies or educational institutions no longer try to attract computer programmers as outsourcing practices are being well developed.
Instead, they are in search of highly qualified IT instructors, which are much more valuable, because they can be considered as „capital assets" in training new specialists.

4.3.7. COMMUNICATIONS AND INTERNET ACCESS

Around 90% of the institutions have access to the Internet - only 30% from those are represented on the Web. Half of the institutions are connected to the Web via Dial-Up and virtually no institution uses satellite connection, which means that they have extremely limited possibilities for utilizing the world Internet resources and in introduction of Distance Learning.

Graph 4.3.4. Type of Internet Connection



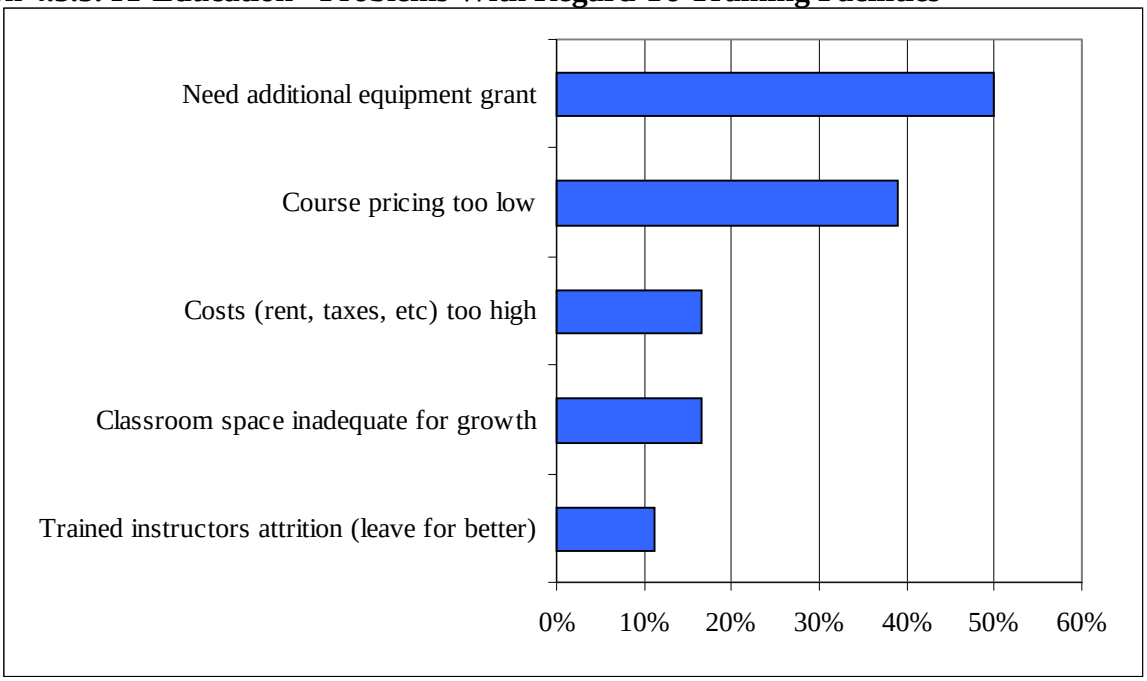
4.3.8. PROBLEMS

Although the general treatment on business problems is provided separately, we found it reasonable to present the concerns of IT Educational institutions in more detail.

Facilities

The survey information showed that half of the institutions are insufficiently equipped with computers and other EDP hardware and office equipment. Many institutions need now, what is called „supporting hand“ in the form of grants.

Graph 4.3.5. IT Education - Problems With Regard To Training Facilities



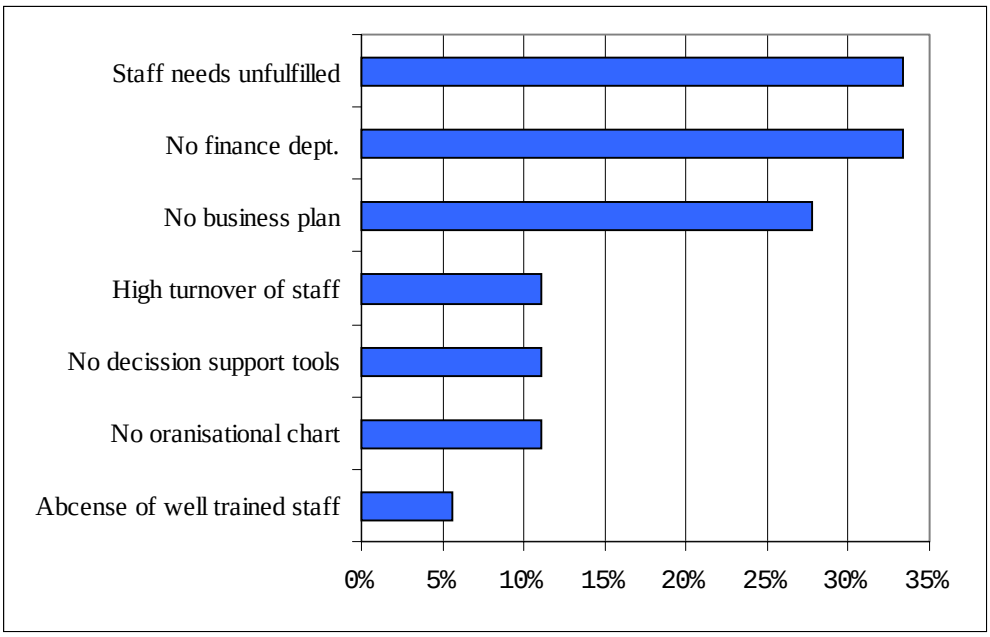
The institutions are in difficult financial situation, mostly private institutions. This is the result of low pricing for delivered courses, which in turn is dictated by the low paying capacity of the population.

Despite these difficulties, the institutions retain their staff and specialists, keeping the level of staff rotation at a low, only 10% of the institutions reported high level of instructors' turnover.

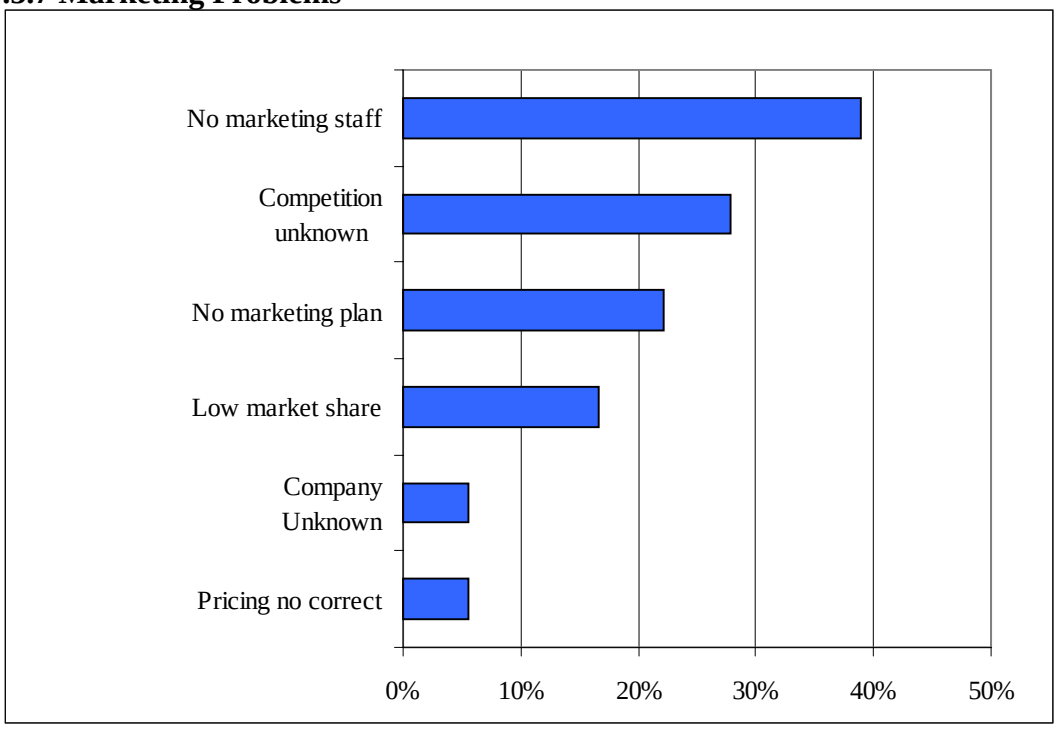
Naturally, 17% to 18 % of the enterprises surveyed (these are private institutions), claimed to have limited classroom space, which restricts the growth potential of the institutions.

The same percentage is reported for such obstacles like high lease rates of working premises and exaggerated taxes.

Graph 4.3.6 Management Problems

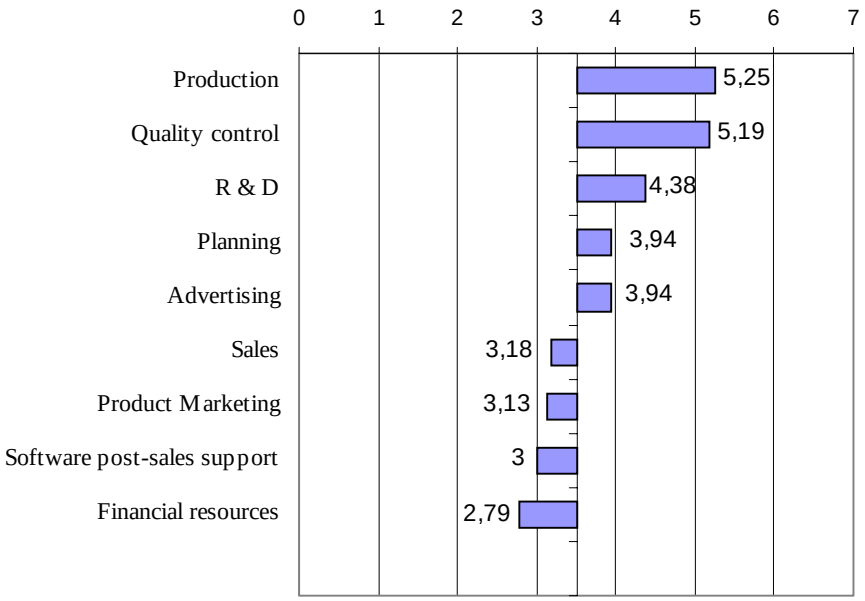


Graph 4.3.7 Marketing Problems



The IT Educational institutions have relatively more problems with regard to Management and IT Marketing that the average for all IT sub-sectors. Part of this problem can be attributed to the low margin of profit and some degree of dependency upon the Ministry of Education.

Graph 4.3.8 Strengths and Weaknesses of the Educational Institutions (by their managers' perception)


0
1
2
3
4
5
6
7
Production
Quality control
R & D
Planning
Advertising
Sales
Product Marketing
Software post-sales support
Financial resources
5,25
5,19
4,38
3,94
3,94
3,18
3,13
3
2,79

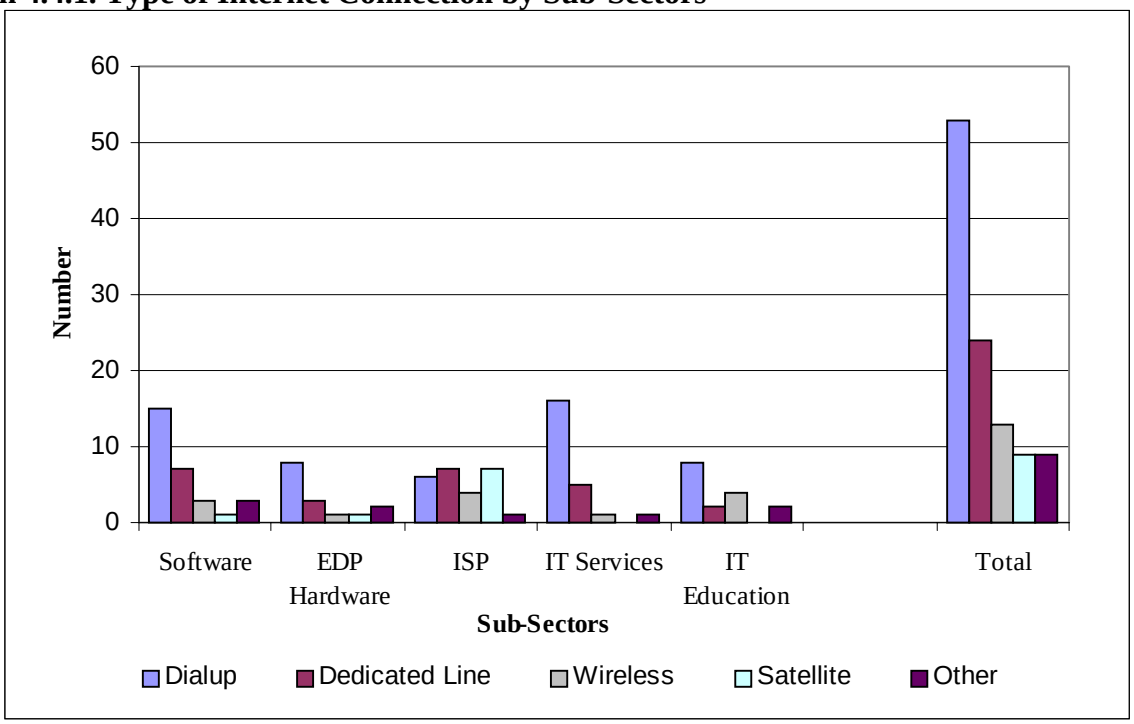
4.4. The State of Telecommunications of IT Industry

4.4.1. INTERNET ACCESS

Starting from 1992 when Arminco Company set up its first server, the Internet has begun its history in Armenia. Since that time the development of Internet showed little progress despite the high demand for it and ISP sector still carves its way in Armenia in spite of numerous obstacles on the way.

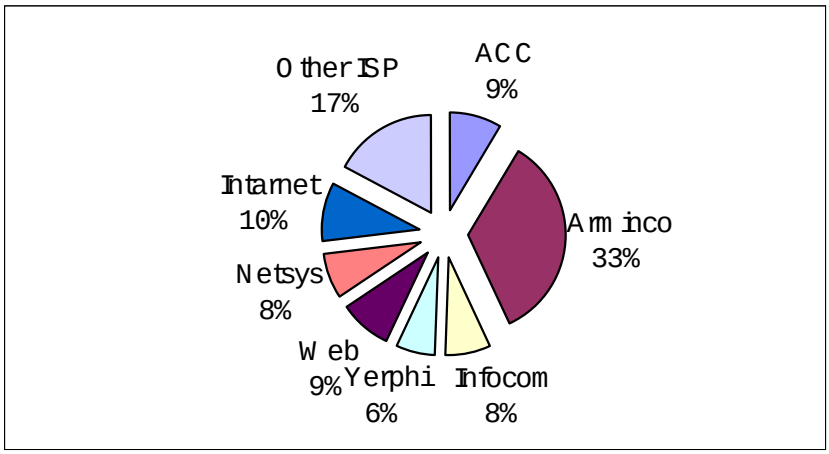
Among the 100 IT companies surveyed only 86 have access to Internet. All the surveyed companies who belong to IT Hardware sub-sector (7 companies) are not connected to the Internet. If we do not take into account the IT Hardware sub-sector, then, the percentage of companies who are connected to the World Wide Web comprises 92%, as per surveyed companies. Although the given percentage is high enough, nevertheless, most of the companies use Dial-Up connection type, which is of poor quality and has very low capacity due to the state of telecommunications in Armenia.

Graph 4.4.1. Type of Internet Connection by Sub-Sectors



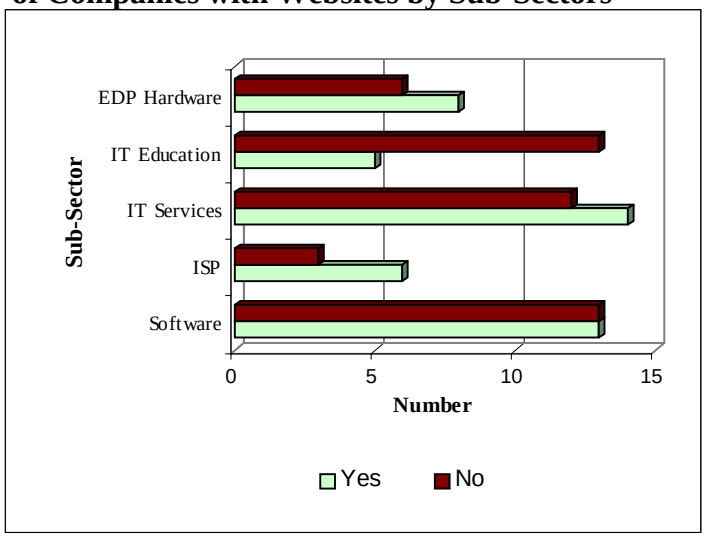
Due to instability of Internet services, its poor capacity and speed, bad quality, insecurity and possibly high pricing, 17% of IT companies which have internet access (excluding ISP companies) whose business operations highly depend on Internet, are forced to have more than one ISP to insure the uninterrupted running of their business operations. The importance of Internet for IT companies is further emphasized by the fact that they prefer to pay additional money for the second, so to say „back-up“ ISP in order to stay online.

Graph 4.4.2. ISP's Market Share Within Surveyed Companies

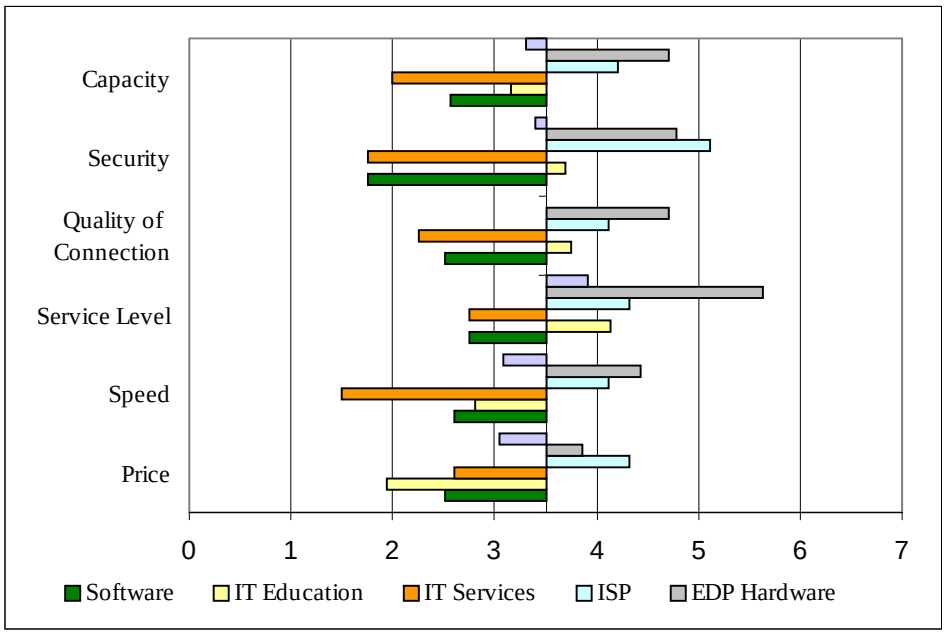


Only 43% of the surveyed companies are represented on the World Wide Web. But, on the good side of it, is the fact that more Web related computer-programming languages are introduced into the curricula of IT Educational institutions and increasing interest in Web Design and Development indicates that the percentage of organizations who have companies' web-sites is more likely to increase.

Graph 4.4.3. Number of Companies with Websites by Sub-Sectors



Graph 4.4.4. Satisfaction and Dissatisfaction with Internet Connection by Sub-Sectors



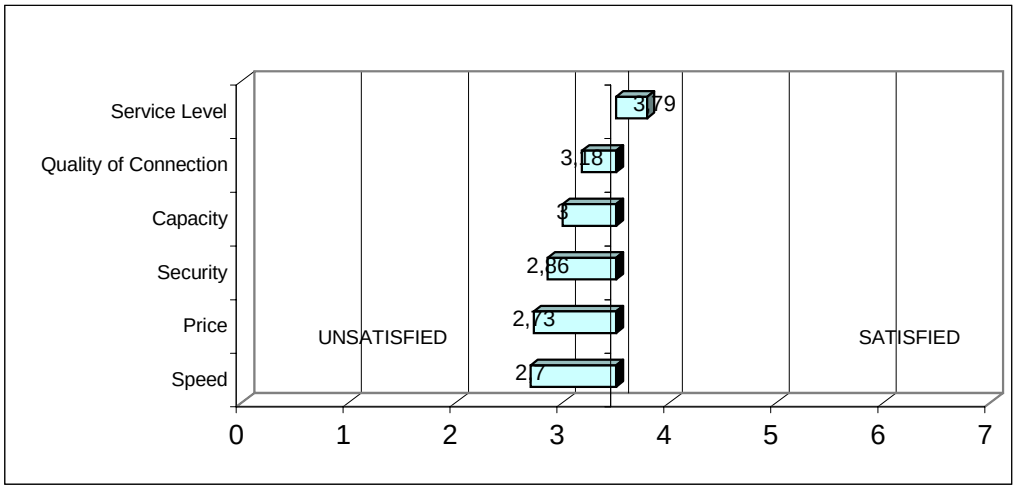
The graph 4.4.4. shows that the dissatisfaction is mostly expressed by Software and IT Services and in some degree by IT Education sub-sectors, which is quite explicable i.e. the Software sub-sector is much concerned about the security of the Internet, capacity and quality due to the nature of their business. Internet services are hardly affordable for IT Education sub-sector, and this is the major obstacle for accessing the rich educational resources of the Internet, and in introduction of distance learning courses.

The dissatisfaction on the part of Software companies mostly should be attributed to local companies as most of the foreign firms are connected to the Internet by dedicated line or by means of satellites and therefore have fewer problems with regard to Internet in comparison with the local ones.

The EDP Hardware companies have not yet started web-based business and generally do not utilize all the capacities of the Internet.

The graph 4.4.5. below more fairly represents the level of dissatisfaction with Internet excluding foreign software companies because of the reasons said above and the ISP as they are the first link in the chain of Internet provision.

Graph 4.4.5. Satisfaction and Dissatisfaction without ISPs and Foreign Software Firms

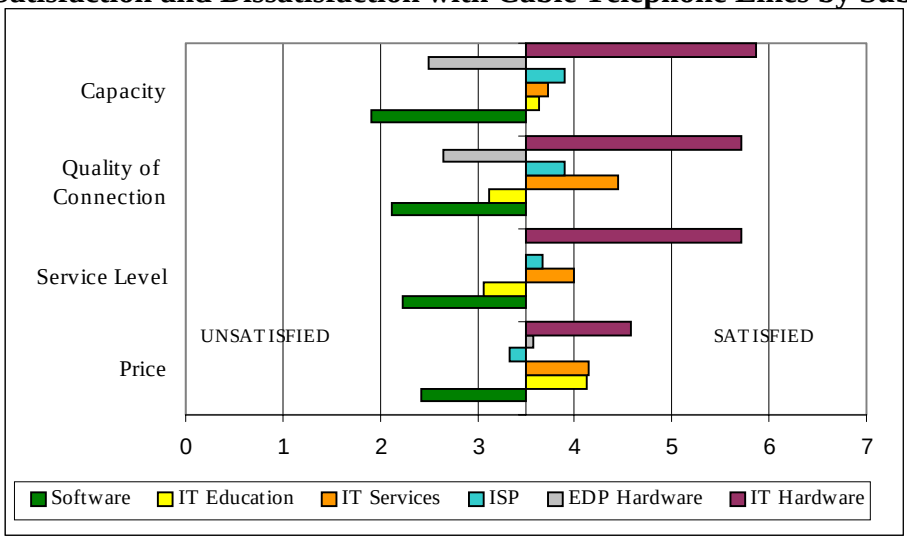


4.4.2. CABLE TELEPHONE LINES

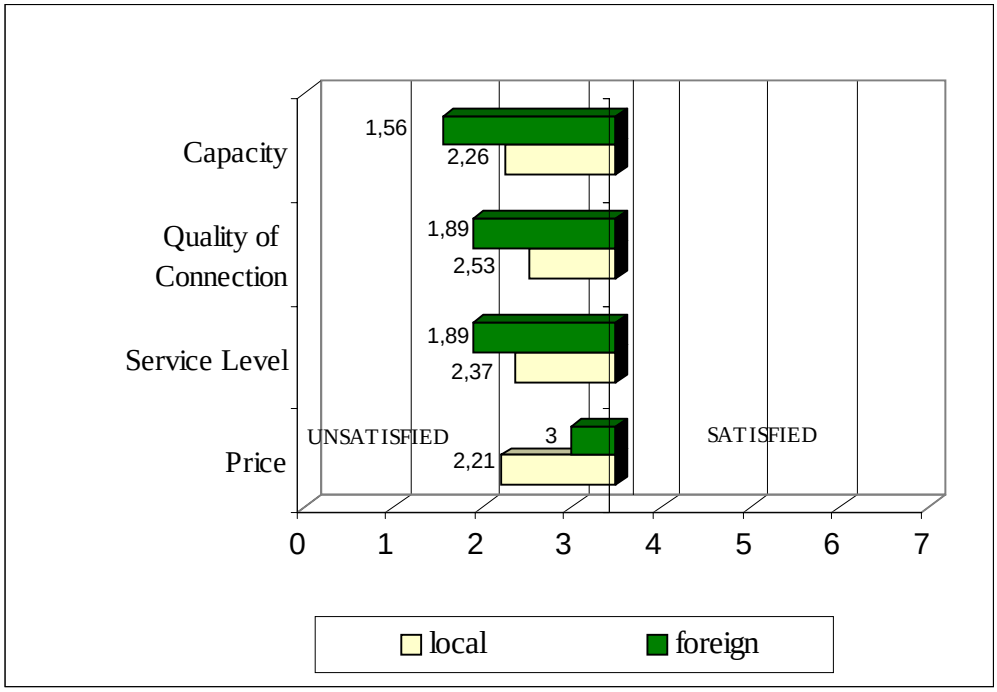
70% of the surveyed companies are users of digital telephone lines. IT Hardware companies are passive in marketing operations and do not use marketing tools, do not have Internet connections, company websites, digital phone-lines and are satisfied with the conventional telephone lines. ISPs are more or less satisfied with cable telephone lines as they have the best available connections. This time again, we encounter

problems on the part of software sub-sector. Unfortunately, the development of the most dynamic sector of ITI is biased by insufficient quality of telecommunications.

Graph 4.4.6. Satisfaction and Dissatisfaction with Cable Telephone Lines by Sub-Sectors



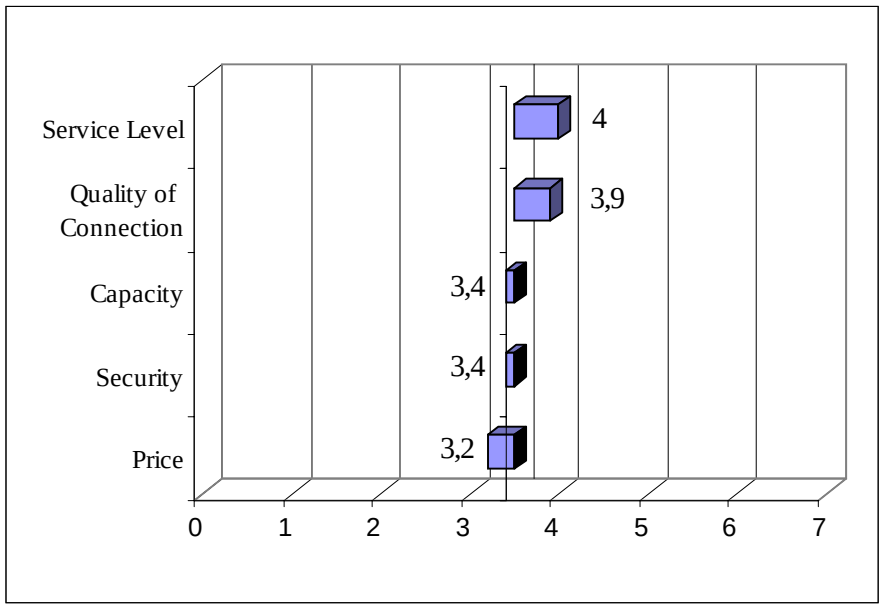
Graph 4.4.7. Satisfaction and Dissatisfaction with Cable Telephone Lines within Software Companies



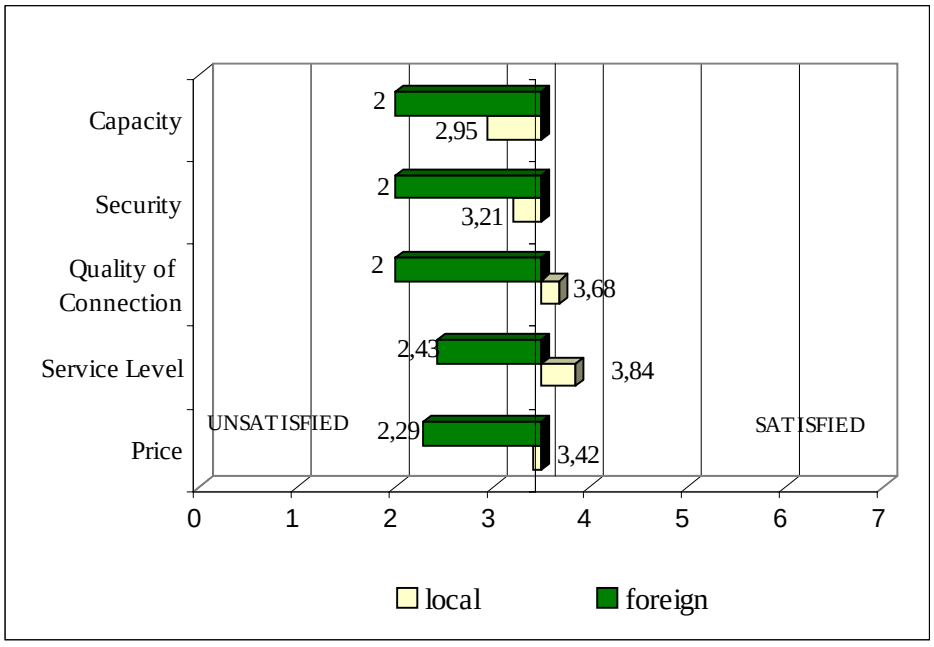
4.4.4. WIRELESS/MOBILE TELEPHONE LINES

Surprisingly among IT managers only 73% percent answered to our questions relating mobile phone or GSM services utilization, the rest 27% said that they could not afford to use it and cover corresponding expenses.

Graph 4.4.8. Satisfaction and Dissatisfaction within Mobile Phones Holders



Graph 4.4.9. Satisfaction and Dissatisfaction within Software companies Mobile Phones Holders



The most dissatisfaction for all three types of communications is expressed by software sub-sector, which has the biggest share in export and intensively utilizes all telecommunications means for its daily business operations. Higher degree of dissatisfaction on the part of foreign software companies speaks about their experience with better quality-services outside Armenia and this could be the real evaluation of provided services and can be used as a benchmarking tool.

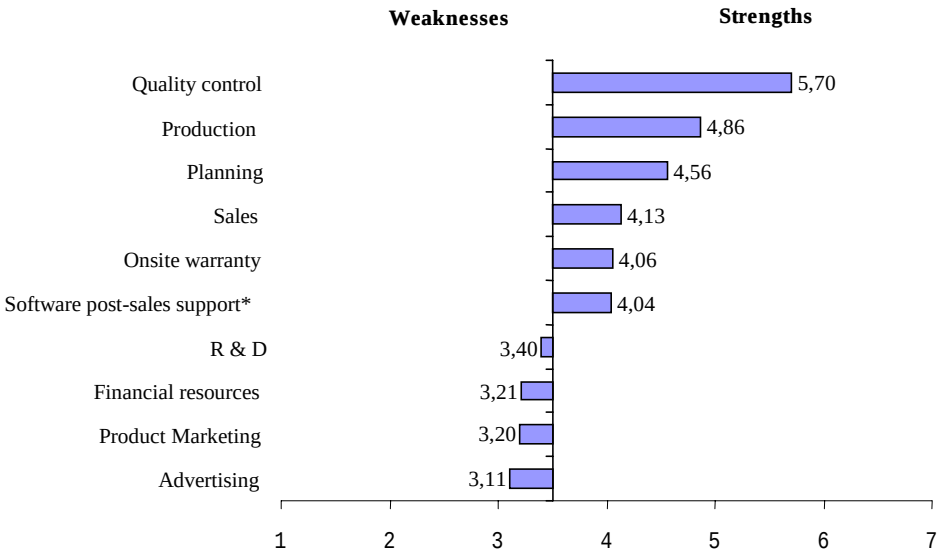
During personal interviews with companies' managers, we requested them to prioritize the four major problems identified during survey: legal, telecommunications, military service and education. Eighty seven

percent of the managers mentioned that the current state of telecommunications and Internet in particular, and the speed of its development, is the biggest obstacle for their companies' growth.

4.5. Business Problems

Various business problems faced by the companies is a natural component for the economies in transition and Armenian companies are not an exception. In the survey questionnaires the managers of the companies were suggested to assess the strengths and weaknesses of their organizations, as they perceive them. The graph 4.5.1 below pictures the perceptions for the IT Sector as a whole.

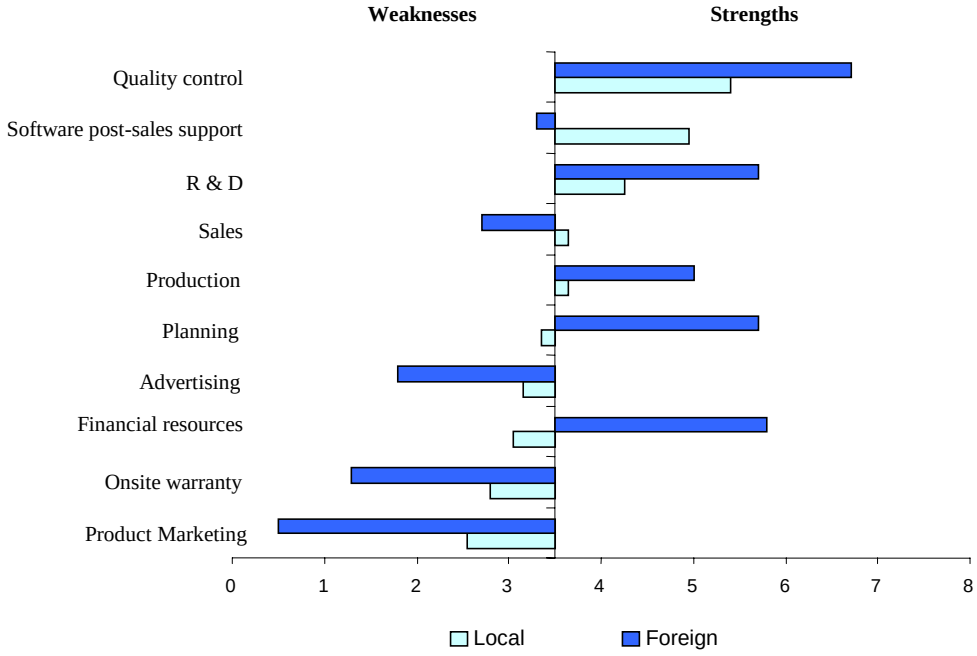
Graph 4.5.1. Weaknesses and Strengths of IT Companies by Companies Managers Perception for the Whole ITI



*This indicator is only for 5 sub-sectors, but IT Hardware.

As it is clearly seen from the graph 4.5.1., the managers of the companies are quite confident on the quality control, production and planning. On the opposite extreme we find such weak points as Product Marketing and Advertising.
Due to specifics of software sub-sector it is worth to present a separate graph 4.5.2. depicting the differences between local and foreign software companies.

Graph 4.5.2. Weaknesses and Strengths of Software Companies by Managers Perception

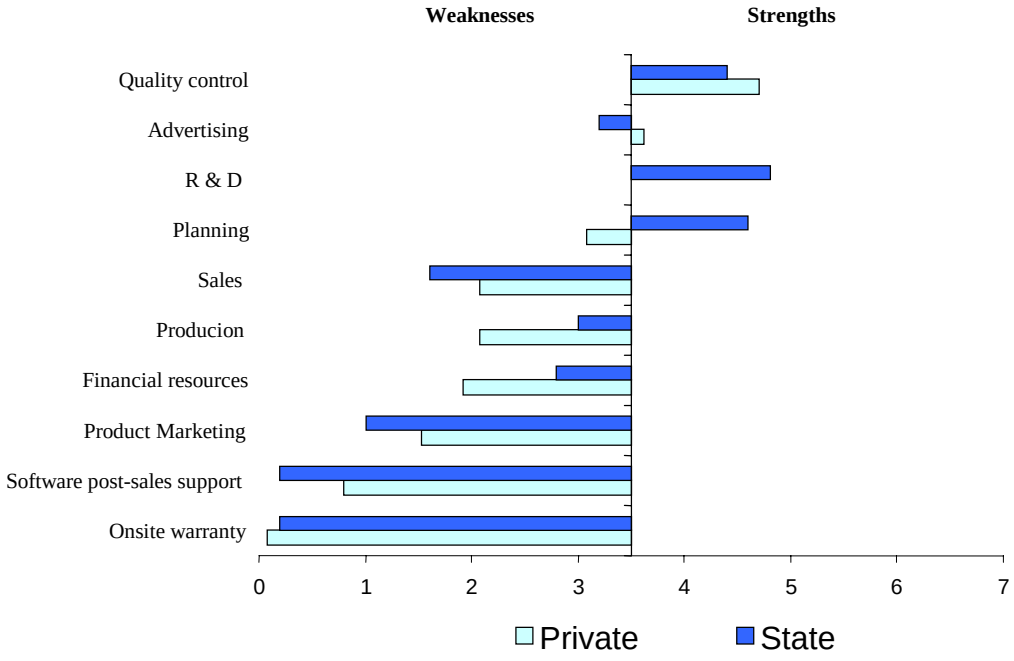


It is to be noted that the Product Marketing considered by foreign companies as a weak point needs some explanation. Thus, the Marketing departments with the corresponding staff of foreign companies are located at their headquarters abroad. On-site warranty also cannot be related to the Armenian market as the developed software is exported directly from Armenia. The same applies to the advertising and post-sales support.

The strengths of local companies in quality control, post-sale support and R&D are explained by the high technical human capacities of companies. Quite naturally, we come across marketing issues in the local companies. Due to low level of product marketing and advertising (the marketing expertise and limited financial resources do not allow it) their sales are stuck somewhere in the middle of the axis. The close interrelationship between the factors proves the answers to be objective.

Another IT sub-sector which is IT Education needs more attention not only due to high rate of growth, but also due to its primary role in supplying human capital to both the whole economy and its sector - IT industry - and for information distribution towards the Armenian society. The IT Education sub-sector is characterized by the division of the institutions into two groups: state owned and private. The graph shows that the institutions in state and private sectors share similar problems. Still, some differences persist. It is obvious that the state institutions have fewer problems than the private ones what regards space and equipment. Due to shortage of equipment, limited financial resources and institutional memory of human capital in private sector, the institutions are relatively passive in Research and Development activities to contribute outstanding outcomes into the educational process. However, as many managers stated, private institutions are more dynamic in responding to market demand in willingness to introduce new curricula, but the government procedures in permitting the new courses are too heavy to implement them quickly.

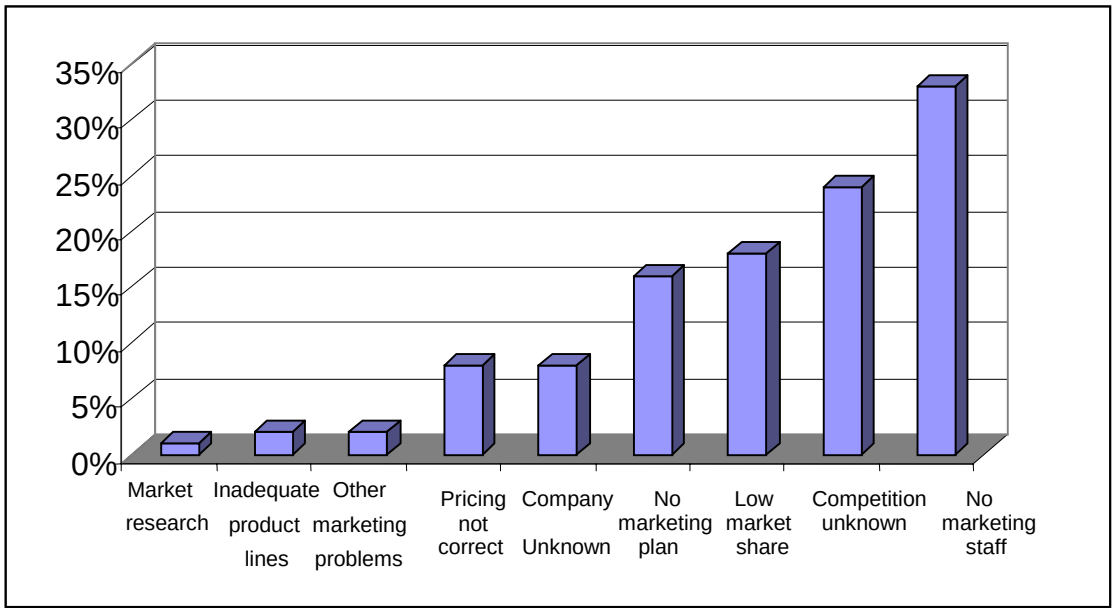
Graph 4.5.3. Weaknesses and Strengths of IT Education Companies by Companies Managers Perception (state and private)



State institutions consider planning as their strong point. This is natural because, the state owned enterprise is usually under the protection of the state and finds itself in a more privileged and stable conditions. Also, even though, the state institutions admit they are strong at planning, this is in direct contradiction with the statements of the software companies' managers who have to re-train the graduates to upgrade their skills received in the state institutions. This might be the result of poor contingency planning on the part of state institutions, mainly because the planning horizon for IT industry is relatively closer than in other industries and the state institutions fail to recognize and quickly respond to the market demand which in fact is very dynamic.

Our questionnaire has been designed in such a way that allowed us to identify companies' problems in IT Marketing and Management independently on the perception of managers. With our tools we identified that indeed there are major problems but much more than managers perceive. The answers given by the companies seem to be inconsistent with each other. Thus, almost 35% of the companies mentioned the lack of marketing staff as a problem, in the mean time the market research and lack of public awareness about their companies have been given less than 10%. The recognized need for information about competitors and development of marketing plan is in contradiction with the lack of interest in market research.

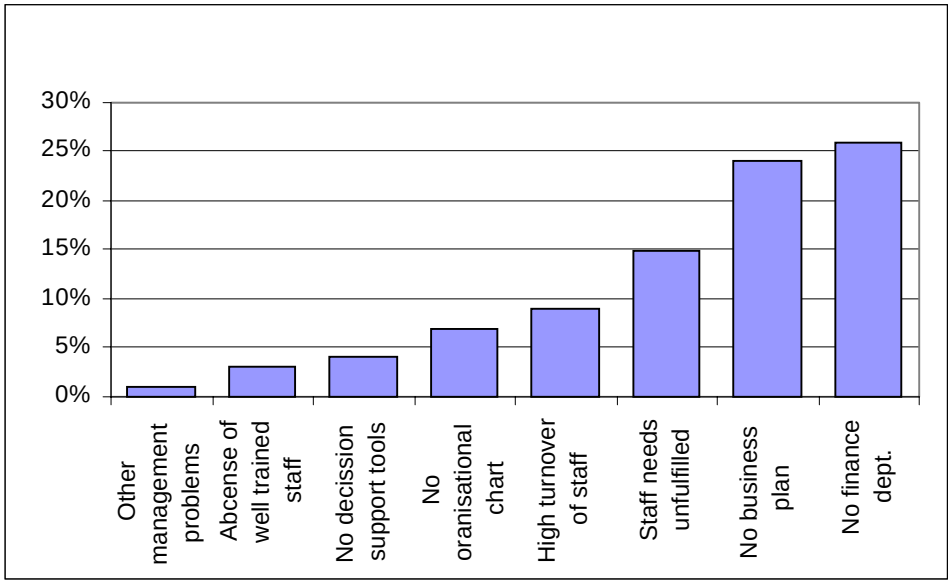
Graph 4.5.4. IT Companies Problems with Regard to Marketing



The above serves as an indicator that the marketing expertise of the organizations is far less than adequate. Those findings drove us to the understanding that the majority of managers do not have clear ideas or structured knowledge on what IT Project Management and IT Marketing are. As our personal interviews proved, they are practicing the method of „trial and errors“ and their intuitions in their activities and decision-making.

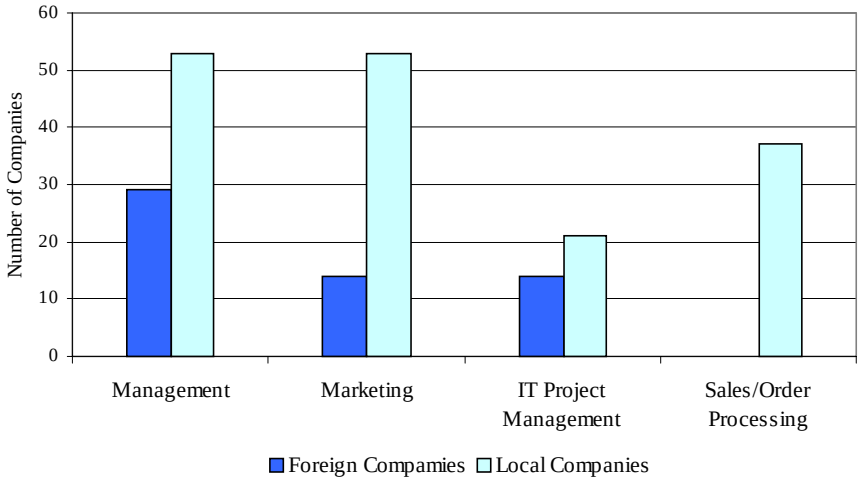
The same inconsistency is peculiar for Management problems (graph 4.5.5.). Thus, the organizations are more concerned about the lack of financial department and business plans and at the same time less attention is given to the absence of well-trained staff. In other words, they are more relying on structure than on people.

Graph 4.5.5. IT Companies' Problems with Regard to Management



Some differentiation must be made between local software companies and foreign ones. As expected (graph 4.5.6), the foreign companies came out with fewer problems, as the marketing, management and sales departments are generally located at their headquarters abroad.

Graph 4.5.6. Software Companies' Organizational Problems (foreign and local)



The more detailed analysis on Management problems reveals that the software companies, mainly local ones, do not have a separate financial department 30%, do not develop business plans 20%, and cannot meet the staff needs, also 20%.

What regards Marketing problems, the state of affairs is similar to those in the field of Management. The basic problem here is the lack of marketing staff among 35% of local software companies and in these cases the manager is usually involved in some market activities on the day-to-day basis. The result of such unstructured marketing approach is the unawareness about the competition in the market, which accounted for 30% and low market share reported by 20% of the companies. Among other identified problems are the lack of marketing plan and market research. The foreign companies as expected, report fewer problems in this field.

An interesting notion, the local software companies do not mention technical problems, except those, related to telecommunications. This means that the technical base, i.e. equipment, and human resources (except marketing staff) are sufficient for companies' operations.

Although the companies possess comparative advantages such as an inexpensive labor and competitive advantage such as high technologies, they are short of strengthening those advantages by means an advanced marketing and management expertise and cannot fully utilize the potential of contemporary communication systems for promotion of their products in the international markets, thus staying away from the world wide evolvement of e-commerce and e-business.

4.6. Business Environment

4.6.1. Possible Impacts of Laws and Regulations on ITI Development

Survey shows that the majority of companies' managers (in average 83%) is not familiar with legislation and regulations, and do not have the opportunity for legal consultancy while dealing with government officials. At the same time they claim that cannot afford legislation amendments. The table below presents answers of companies' managers who are familiar with regulatory framework and problems they identified and solutions they suggested.

Table 4.6.1. Percent of Companies Having Problems with the Following Laws, Regulations and Procedures

Laws, Regulations and Procedures	Percent of companies having problems	Top Problems	Suggested Solutions
Property Protection Law and other Related Rights	17%	a) the law does not work b) after 10 years the property rights came back to the author c) lack of experts in the field	a) do not know b) make it contractual
Copyright Regulation in Civil Code	17%	a) the law does not work b) not secure property rights for companies c) not correct formulations of provisions	a) do not know c) lack of experts in the field
Patent Law	9%	a) the law does not work b) procedures take a lot of time c) problems with certificates	a) do not know b) solve problems with certificates
Other Legal Problems	15%	a) laws do not work b) too high VAT rate **c)** instability of legal system	a) do not know b) to reduce the tax rate c) to keep the legal system stable
Customs Regulations	19%	a) too high duties rates b) problems with VAT return c) red tape d) several problems with import	a) to lower duties rates b) problems with VAT return c) allow permanent import for a year d) do not tax educational materials e) to require only invoice
Tax Regulation	28%	a) too high tax rates b) instable legislation c) wrong tax policy which prevents business development d) illegal tax collection e) VAT problems g) export is discouraged	a) do not know b) improve the law c) to reduce tax rates d) business should be aware about prepared drafts e) stable law
Procedures for Audits and Inspections provided by Tax Inspectorate	31%	a) very unpleasant attitude of inspectors b) inspectors are not controlled c) procedures are frequently changed	a) to educate or force inspectors to conduct civilized attitude b) to implement audit control c) stable procedures
Problems with Financial and Banking Regulations	15%	a) loans are unavailable and unaffordable b) resources are expensive d) no leasing provisions	a) to eliminate high collateral requirements b) to encourage leasing
Other Regulations	10%	a) no consistency b) complicated regulations d) they are not service oriented	a) to make them consistent b) simplify and clarify regulations d) to make them service oriented

We are presenting some emotional comments from questionnaires made by managers:

- It is difficult to survive in the country with such legislation!
- The State's and its civil servants' attitude towards the business is unbearable!
- ArmenTel Monopoly is the killer of IT business.

The minority of businessmen, who considers themselves to be familiar with the legislation, has in fact superficial knowledge on legal issues. The main reason the laws cannot be enforced is the lack of awareness on the legislation issues and the laws in particular on the part of legal and physical entities subject to the corresponding legislation. This is further aggravated due to the absence of litigation practices and not effective court system in Armenia, which is one of the most important components of the law enforcement. We should also consider the fact that the small and medium businesses often cannot afford legal consulting and have limited resources to participate in court procedures. The most important prerequisite for the solution of the problem is the establishment of legal consulting organizations, which would be professional enough to provide either legal advice or assist in advocacy rights protection to the entities. The issue of lack of laws enforcement is more prioritized for the Tax and Customs systems than the implementation feasibility of the laws themselves.

One of the serious obstacles for the development of companies is the unlimited authority exercised by customs officers what regards the determination of value for imported products. As an alternative solution for the above issue we could emphasize the development and putting into practice the value determination procedures for customs.

Intellectual property rights problems[16]

The Civil Code, as well as the Law „On Copyright and Neighboring Rights"[17] (the „Copyright Law", adopted on December 8, 1999) provide a considerable level of Intellectual Property Rights (IPR) protection. However, some provisions of the IPR legislation fall short from internationally accepted standards:

- Article 18 of the Copyright Law: allows the free reproduction of computer programs and machine-readable databases, as well as free de-compilation of computer programs, under certain circumstance enumerated in the Law.
- Article 19 of the Copyright Law and Article 1128 of the Civil Code: Under the concept of „Employment Work", the copyright of the work created during an employment assignment belongs to the author, who has created the work. The right of use to such Employment Work belongs to the employer, however, only up to 10 years from the moment of the presentation of the Employment Work. Upon the expiration of the 10 years term (or even earlier, with the consent of the employer), the right of use is fully transferred to the author (employee), despite of any contractual agreements.
- Article 28 of the Copyright Law: Provides the same 10 years limitation on the right of use to works created under „Author's Contracts", allowing the author to unilaterally withdraw his/her consent to the right of use, notwithstanding the time period stated in the contract.

However, the absence of proper copyright laws, as well as the lack of an enforcement of existing IPR regulations, as many managers mentioned, forced them to register their properties in other countries to be protected. Moreover, in spite of Armenian Government efforts in protecting IPR by joining to International Agreements and improving some provisions in Customs Code [18] „examples of counterfeits and pirated products are widespread in Armenia, and in practice, there are essentially no cases of judicial enforcement of any copyright infringements."

4.6.2. POSSIBLE GOVERNMENT INDUSTRY PARTNERSHIP DEVELOPMENT

Thirty seven percent of companies' managers are ready to be involved in law and regulations drafting.

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[16] Analysis is provided by Managing Director of HPLA L.L.C. Mr. Andrew Hovhannisyan and formulated in the ICT Master Strategy for Republic of Armenia, Draft, USAID, June 2001.

[17] The Copyright Law provides protection of **database** (as a compilation of data and other materials [articles, accounts, facts, etc.], systematized in machine-readable or other form, which by the reason of the selection or arrangement of its content, is a result of a creative work.) and **computer programs**, expressed in any programming language and form (including application programs, operation systems, source code and object code).

[18] ICT Master Strategy for Republic of Armenia, Draft, USAID, June 2001. „The Government of Armenia has made some improvements so far:

Armenia has joined the Berne Convention.

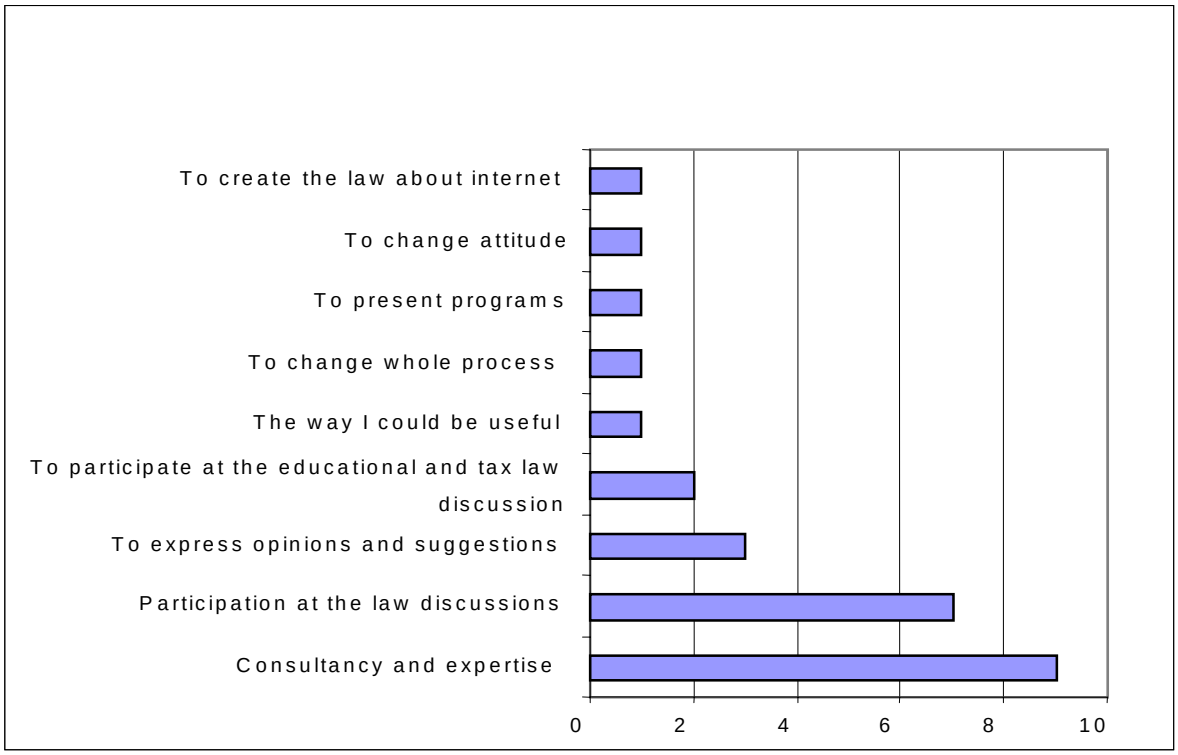
The Government of Armenia is considering membership in the Geneva Phonograms Convention.

The new Customs Code has been enacted as of January 1, 2001, which restricts the import or export of goods and vehicles, which endanger, as defined by law, intellectual property rights (Articles 19 and 20 of the new Customs Code)

The new Customs Code also provides for the application for suspension of release from Customs of goods infringing upon intellectual property rights (Articles 227-233 of the new Customs Code.)

And in addition, Armenia has become a member to the World Customs Organization („WCO") in 1992, World Intellectual Property Organization (WIPO) in 1993."

Graph 4.6.1. Managers Suggested Types of Involvement in the Process of Law Drafting



Obviously, not all the managers expressed their readiness to participate in law drafting processes.
Here again, we could mention as a reason, the lack of awareness on the legislation, but we should not also disregard the absence of any procedures for their participation.

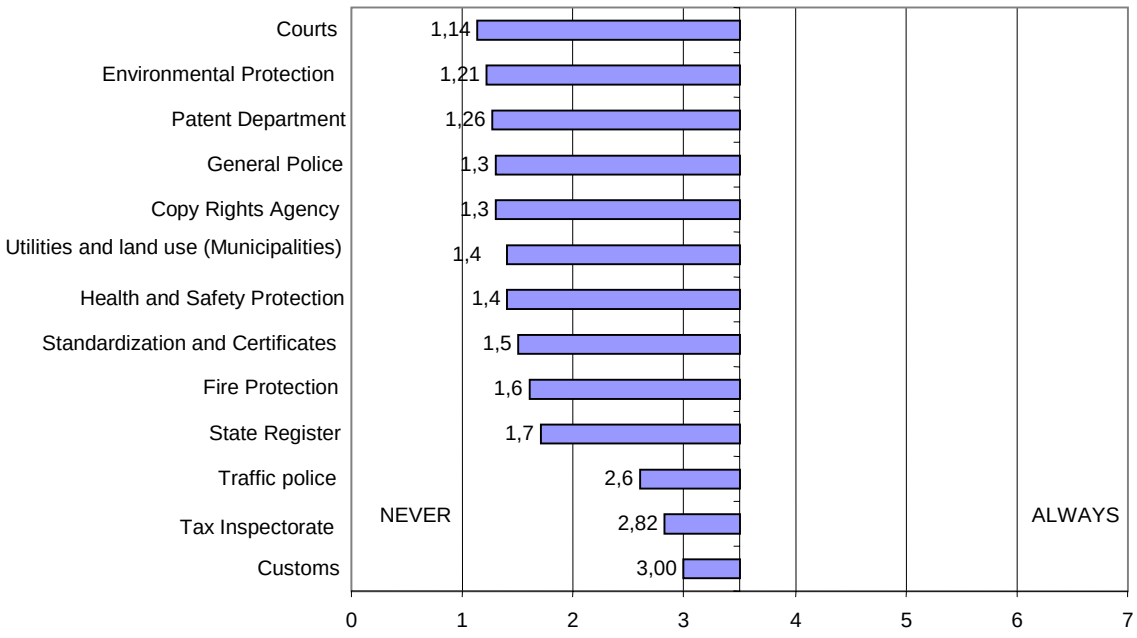
It is important to specify, that the majority of companies' managers will not feel themselves being ignored and would readily participate in the legislation drafting process, provided the procedure for their participation is developed and put into practice.

4.6.3. POSSIBLE IMPACT OF THE GOVERNMENT ADMINISTRATION ON ITI DEVELOPMENT

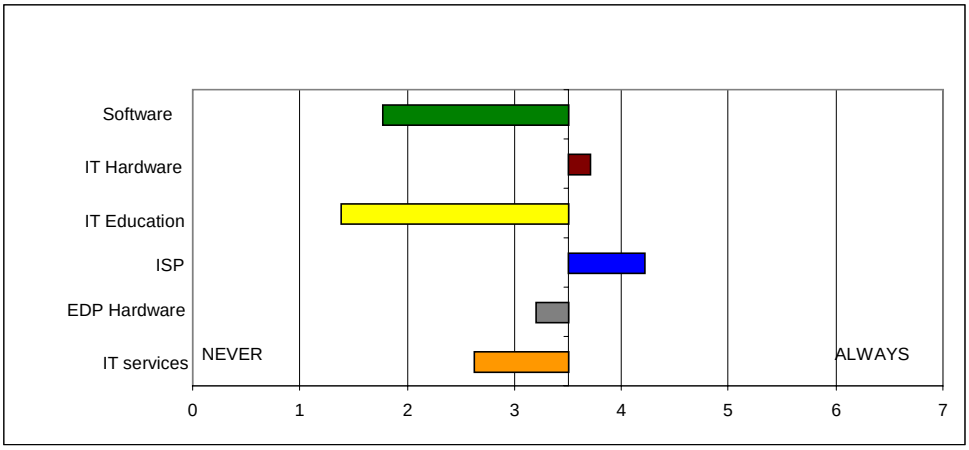
Survey indicates that in contrast with investors' surveys[19], IT companies almost do not experience problems with government institutions. But deeper analysis helped us to identify that some sub-sectors do, but in a smaller scale. However, as another assessment stated[20] this situation could have resulted from widely spread corruption practice, when managers could escape wasting their time on negotiations with governmental officials and dealing with imperfect and usually complicated and vague regulations by paying so called „facilitation money".

[19] Investigation of Factors Inhibiting Foreign Direct Investment in Armenia. MIT/IRIS/UNDP, Yerevan, January 1999, Pp.62-64. Administrative Barriers to Investment: A Red Tape Analysis. Group of Independent Researchers, MIT, Supported by RSS of OSI, 1999 (in press).
[20] ARMENIA: ADMINISTRATIVE BARRIERS TO INVESTMENT. May 2000, Foreign Investment Advisory Service, a joint service of the International Finance Corporation and The World Bank

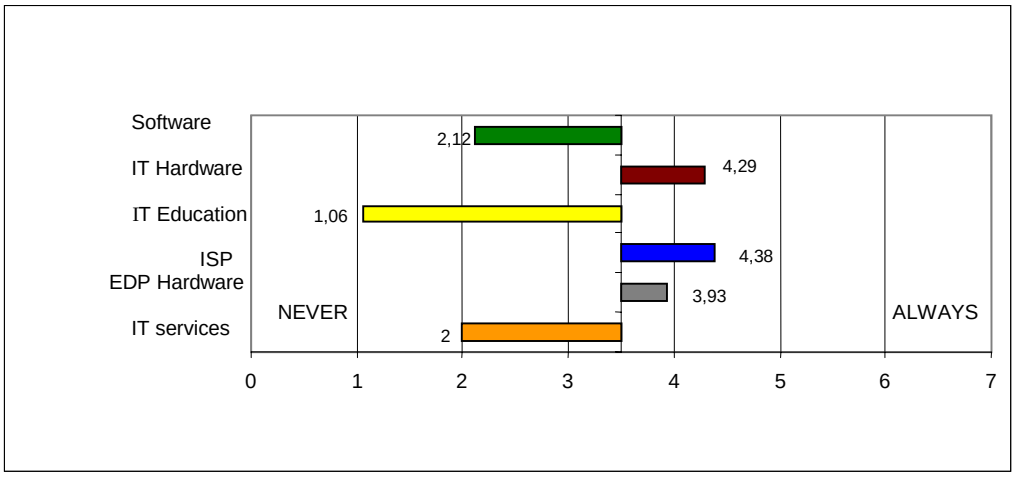
Graph 4.6.2. Frequency of Experiencing Difficulties with Government Institutions



Graph 4.6.3. Frequency of Experiencing Difficulties with Tax Inspection by Sub-Sectors



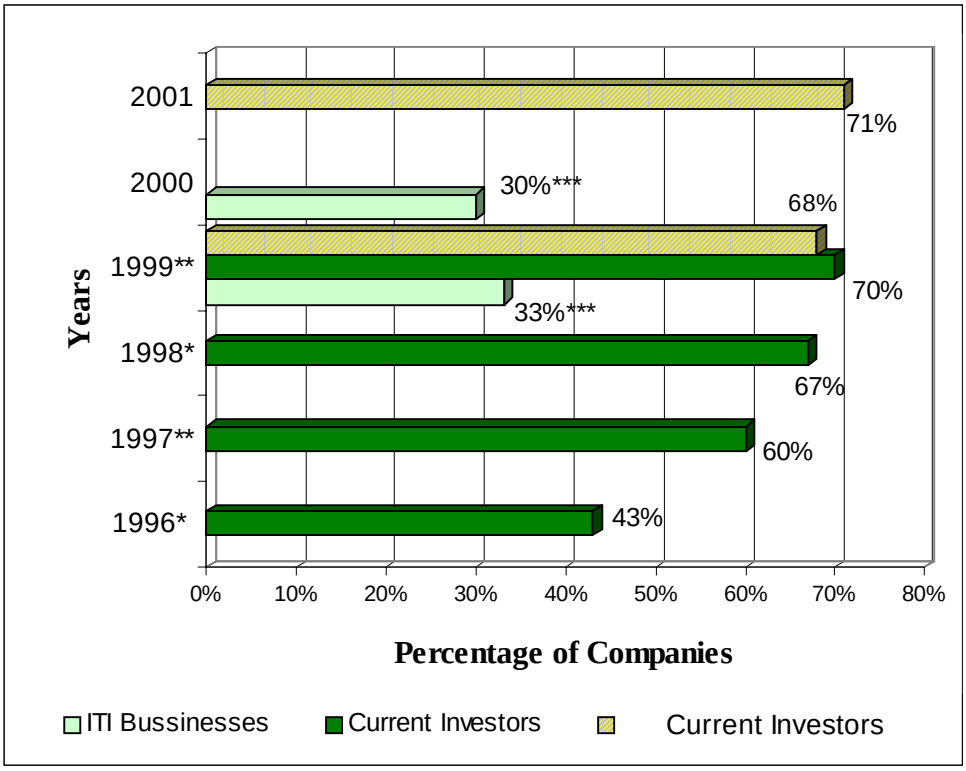
Graph 4.6.4. Frequency of Experiencing Difficulties with Customs



4.6.4. RED TAPE AND ITS IMPACT ON ITI OPERATION

Comparison of difficulties encountered by ITI companies with local and foreign investors proves that ITI companies due to the specifics of their industry experienced fewer problems and spent two times less time on negotiations with governmental officials. These companies mostly do not have to deal with construction of manufacturing premises and municipal utilities, mostly they are renting small offices (but IT Hardware), do not import huge quantities of raw materials for their production to deal with customs officials and so on. They are less dependent on many governmental institutions.

Graph 4.6.5. Comparative Percents of Companies that Spent More than 15% of their Time on Negotiations with Governmental Officials



* Investigation of Factors Inhibiting Foreign Direct Investment in Armenia. MIT/IRIS/UNDP, Yerevan, January 1999, Pp.62-64
**Administrative Barriers to Investment: A Red Tape Analysis. Group of Independent Researchers, MIT, Supported by RSS of OSI, 1999 (in press). Denoted as dark green columns.
*** „Interim Report" RSS No. 1735/2000 „Foreign Direct Investment in Armenia: Political Risk and Project Evaluation"

4.6.5. REACTION ON BUSINESS ENVIRONMENT

The following data helped us to identify an openness of companies to share information related to their businesses. Only 14% of the enterprises answered to this question.
And with regard to the question „*What are the salaries of your staff as per the following categories: specialists with up to 5 years of experience, 5 years of experience, and with more than 5 years of experience*" only 31% of the SW sub-sector companies presented information on this subject.
Majority of companies refused to answer the questions regarding the ranges of salary and company's annual turnover, which are usually open for dissemination.
According to this information we could calculate the following ranges of possible average salaries for the Software sub-sector.

Table 4.6.2. Range of Salaries of Computer Programmers in Software Sub-Sector

Software Companies	Computer Programmers with no experience (US$)	Computer Programmers with less than 5 years experience (US$)	Computer Programmers with more than 5 years experience (US$)
Foreign	200-400	650-800	800-3000
Local	80-100	150-300	200-500

Statistics Bureau of RA for 2000 stated that there are 42,703 companies with less than 100 of personnel operating in Armenia. Among those enterprises, 42,090 (or 98.6%) are private. Statistics Bureau of RA for 2000 also reports average salaries for state companies around 28 US$ and 39 US$ for private companies. None of a company presented their annual turnover.

4.7. ITI Development Potential for Capital Market

With this survey we hoped to identify some IT industry development trends that could serve for us as guideline in working out possible recommendations on the Capital Market development. A hypothesis was that IT companies should look for venture capital and therefore would prefer to establish JSC for this purpose. Unfortunately, the figures and trends obtained during the survey are not promising for development of realistic recommendations.
The following table 4.7.1. presents ownership distribution among surveyed companies.

Table 4.7.1. IT Sub-Sectors Companies Ownership

SUB-SECTORS	Owner-ship	LLC	CJSC	OJSC	Full Partnership	Other
		#	%	#	%	#

According to presented data 70% of all surveyed companies are LLC. Moreover, in the most dynamic SW and IT Services sub-sectors LLC companies account for 76,9% each. Among IT Hardware there are CJSC and OJSC existing companies, but there are almost no newly established private companies with such status. Among surveyed companies 87 are private companies and among them 87% are LLC.

Graph 4.7.1. Companies' Profiles Results According to Companies Surveyed in all 6 Sub-Sectors.

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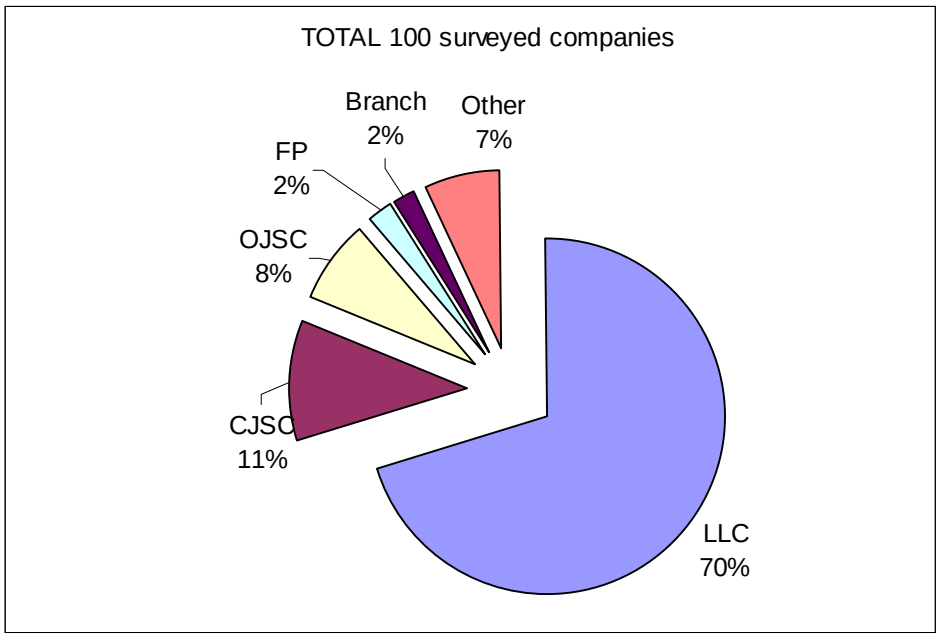
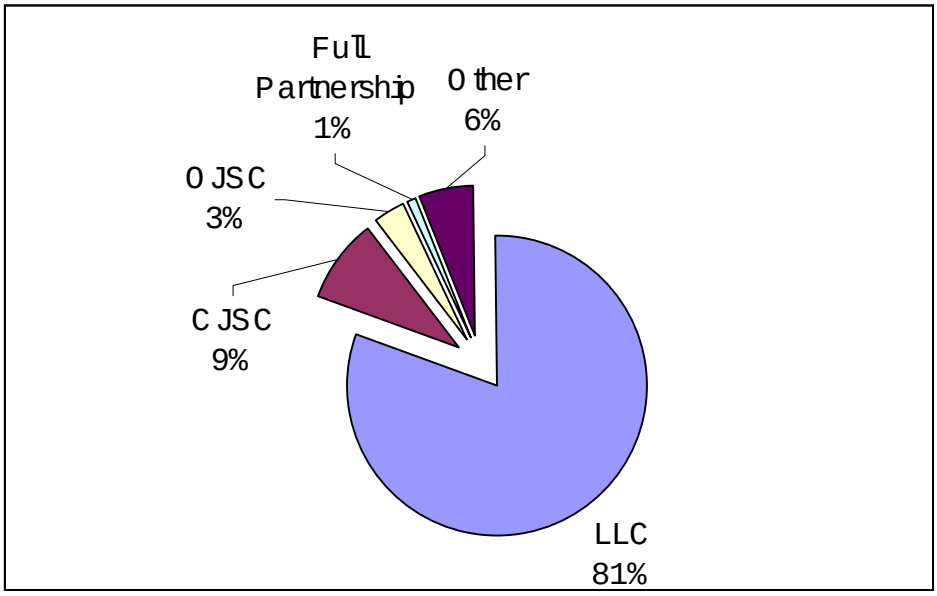


Among surveyed 100 companies 87 are private and 13 are state. Eight percent out 100 surveyed companies are foreign and 92% are local.

Graph 4.7.2. Distribution of Organizational State of 87 Surveyed Private Companies for all 6 Sub-sectors.



It is well known that the newly established companies should show interest to be established as a Joint Stock Company, thus, having more potential for capital raising. The reason they are avoiding the adoption of CJSC and OJSC status is unfavorable Law on Joint Stock Companies and regulations called to regulate securities market. The only one newly established private CJSC company is in EDP Hardware sub-sector. All organizations have been founded after privatization. Furthermore, according to our personal interviews, there are many companies, which intended to reregister to OJSC and changed they mind after adoption of new legislation.

The enterprises who need the attraction of capital stock avoid registering as an Open Joint Stock Company and what is a more subject of concern, according to the information provided by „Association of Shareholders“ most of the organizations are re-registering from OJSC to Limited Liability Companies.

This problem has two main reasons.

1. **Lack of knowledge on legal issues by enterprises.**
   The law on „Regulation of security market“ has been adopted recently and businessmen are familiar only with rigid requirements to OJSC.
2. **Impracticability of law.**

It is necessary to provide legal consultancy for businessmen, and explain them not only the requirements of the laws, but also the implementation procedures, their rights and opportunities provisioned by the legislation.

Unfortunately, the most dynamic sector - IT Industry will not likely make contributions to the capital market development in Armenia due to the hampering regulatory environment, which especially affects startup and inexperienced companies.

4.8. Associations Market Development

Survey of 100 IT companies helped us to identify membership of companies in different associations and unions not only in the field of IT Industry. The following graph presents portliness or relative weight of associations and unions in the IT industry.

Graph 4.8.1. Membership of Surveyed 100 IT companies in Associations/Unions

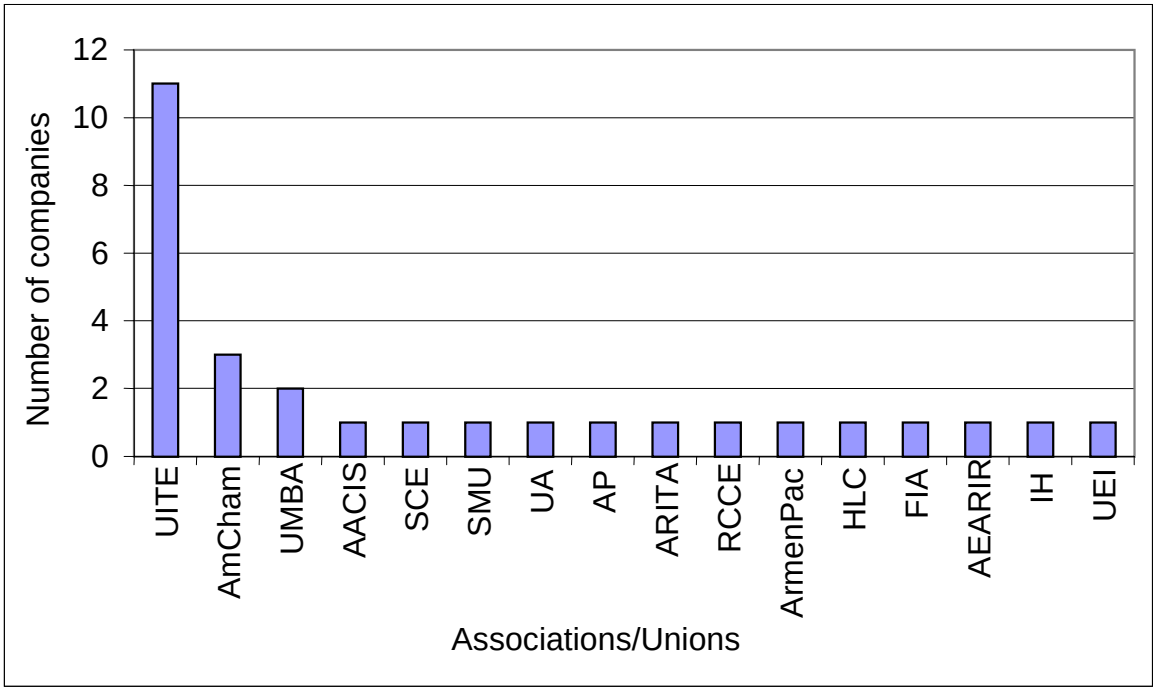


Table 4.8.1. List of Unions/Associations with IT Companies or Their Managers as Members

UITE Union of Information Technology Enterprises	
UA	Union of Auditors
AACIS	Armenian Association of Computers and Information Systems
SCE	Support Council of Entrepreneurs
SMU	Stone-Mansion Union
AmCham	American Chamber of Commerce in Armenia
AP	Association of Programmers
ARITA	Armenian Information Technology Association
RCCE	Regional Commonwealth of Communication Enterprises
ArmenPack	Union of the box and packaged producers
HLC	Hayk Logos Committee

FIA	Foreign Investors Assembly
AEARIR	Association of Employees of the Armenian-Russian International Relations
UMBA	Union of Manufacturers and Businessmen of Armenia
IH	Internet House
UEI	Union of Educational Institutions

According to the information presented in the leaflet of ARITA Association the following companies - CIT Ltd, FV&G Ltd, LSoft Ltd and ISMA are in the list of members of ARITA, but during our survey only LSoft mentioned its membership in this association.

According to survey, as shown on the above graph, 39% of surveyed companies are members of above presented associations/unions. At the same time, the survey helped to identify that 53% of companies would join an association/union to contribute their efforts for common goals and tasks. The interesting fact is that their willingness to join another association or union does not depend on their current membership status.

The survey also identified that they would like to join their efforts for the following activities: Lobbing, Public Relations, Participation to Trade Fair, Training, Information Exchange and Consulting Services.

4.9. Physical Assets

4.9.1. AVAILABILITY OF EDP HARDWARE EQUIPMENT IN ITI

In total, there are:

1866 PC's and workstations in the IT sector (as per surveyed companies)
164 Servers
331 Printers
1309 Modems
1987 Telephones
117 Photo-copying Machines

These can be broken down for the 6 IT sub-sectors:

Software Sector
The Software sub-sector taken separately accounts for 38% of the personal computers available in the surveyed companies, around 30% of the servers, about 20% of the printers, nearly 25% of the modems, around 8% of telephones and 12% of photocopying machines. Distribution of PC's and workstations among foreign and local Software companies are 42% and 58% correspondingly.

Internet Service Providers
The ISP sub-sector separately accounts for 3% of the personal computers among the surveyed companies, around 37% of the servers, about 11% of the printers, nearly 63% of the modems, around 35% of telephones and 9% of photocopying machines.

IT Services
The IT Service sub-sector accounts for 11% of the personal computers in the surveyed companies, around 10% of the servers, about 19 % of the printers, nearly 5% of the modems, around 9% of telephones and 12% of photocopying machines.

IT Education
The IT Education sub-sector accounts for 42% of the personal computers in the surveyed companies, around 15% of the servers, about 41% of the printers, nearly 5% of the modems, around 42% of telephones and 51% of photocopying machines.

The vast majority of PC's and servers are concentrated in the state sector. The state institutions belong 84% of PC's and 62% of servers and only 16% of PC's and 38% of servers to private ones.

EDP Hardware
The EDP Hardware sub-sector accounts for 5% of the personal computers in the surveyed companies, around 6% of the servers, about 7% of the printers, 2% of the modems, 2% of telephones and 7% of photocopying machines.

IT Hardware
The IT Hardware sub-sector accounts for 0.2% of the personal computers in the surveyed companies, no servers, printers and modems found in this sub-sector, some 4% of telephones and 8% of photocopying machines.

4.9.2. SPACE OWNED BY THE ENTERPRISES AND VEHICLES IN USE

We have received data on space owned or rented and vehicles in use and presenting by sub-sectors.
Software Sector.
19 surveyed companies, as foreign, so local ones do not own the space they occupy. 2 local companies own premises with 45-60sq. m. correspondingly. Another three companies (two local and one foreign) reported having 2000, 9000 and 2000 sq. m. of space correspondingly.
No additional spaces for renting are envisaged in 2001.
7 companies own transport vehicles. Total number – 23 units.
In the year 2001 they envisage adding additional 1 unit.
Internet Service Providers
4 companies in this sub-sector do not own premises, but lease. 4 companies own premises covering the area between 100 – 500 sq. m. and 1 possesses company – 2000 sq. m. One organization could not answer to this question.
No additional spaces envisaged in 2001.
2 companies own vehicles. Total number – 4 units.
No additional spaces and vehicles are envisaged in 2001.
IT Services
16 companies in this category are lacking own space. 5 companies own premises covering the area between 80 – 300sq. m. and 1 company owns the space of 1000sq. m. Another 3 companies did not know the answer to this question or would not answer.
No additional spaces are envisaged in 2001.
7 companies own vehicles. Total number – 15 units.
No additional spaces and vehicles are envisaged in 2001.
IT Education
175,000 sq. m. - are occupied by state educational institutions. Private Institutions: 8 institutions do not own any space. 2 institutions own space of 825 and 900sq. m. correspondingly. Another 3 enterprises did not know the answer to this question or would not answer.
No additional spaces envisaged in 2001.
5 institutions own vehicles (3 state and 2 private). Total number – 18 units.
In the year 2001 they envisage adding additional 2 units.
EDP Hardware
8 companies reported of not having their own spaces. 2 companies own premises of 200 sq. m. each. 4 companies did not know the answer to this question or would not answer.
No additional spaces envisaged in 2001.
Only 5 companies own vehicles (7).
In the year 2001 they envisage adding additional 4 units.
IT Hardware
Only one organization replied to this question saying that they own 18724sq. m. area and 7 vehicles. The rest refused to answer or did not know.
No additional spaces and vehicles are envisaged in 2001.

4.10. Training Needs

4.10.1. NEEDS FOR TRAINING IN MANAGEMENT, MARKETING, IT PROJECT MANAGEMENT AND SALES/ORDER PROCESSING

The results of the survey showed strong need for Management, IT Marketing, IT Project Management training consistent for all IT clusters. Among the basic marketing problems firms face with are: the lack of marketing staff and as a consequence - absence of marketing plan, and inadequate information about competition in the market. Companies also report low market share and price determination problems.

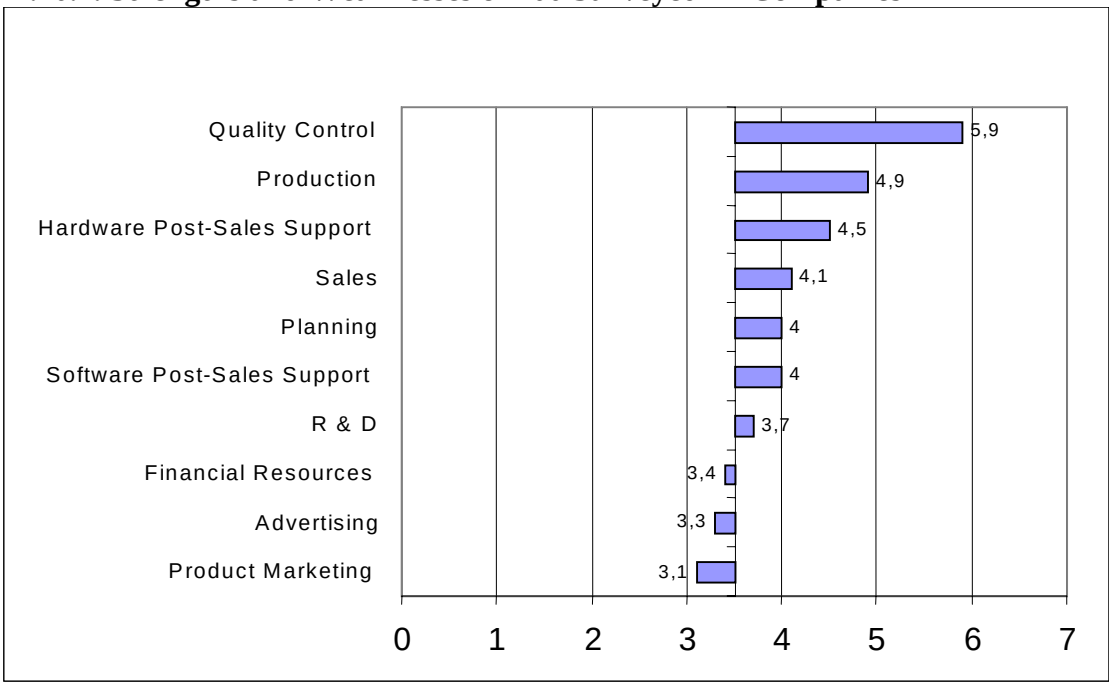
The strong need for training must be more emphasized when looking at the information provided in „Business Problems“ part of this report. The responses witness very low level of Marketing knowledge and practices. The same is applicable to Management problems. The companies lack the very basics of IT Marketing and Management theoretical and practical knowledge and experiences and an extensive training on the concepts of these subjects might considerably enrich the vision and planning abilities of the managers.

As follows from the information obtained from the survey, 55% of the companies (among the surveyed) in all IT sectors encounter difficulties with one or several marketing issues. This figure is highly probable to increase if to consider the whole IT industry in Armenia.
Among the basic marketing problems the firms faces with are:

1. The lack of marketing staff, as reported by 34% of the surveyed companies.
2. 24 % of respondents do not have information about their competitors.
3. 18 % of the companies have low market share.
4. 16 % do not have marketing plan.

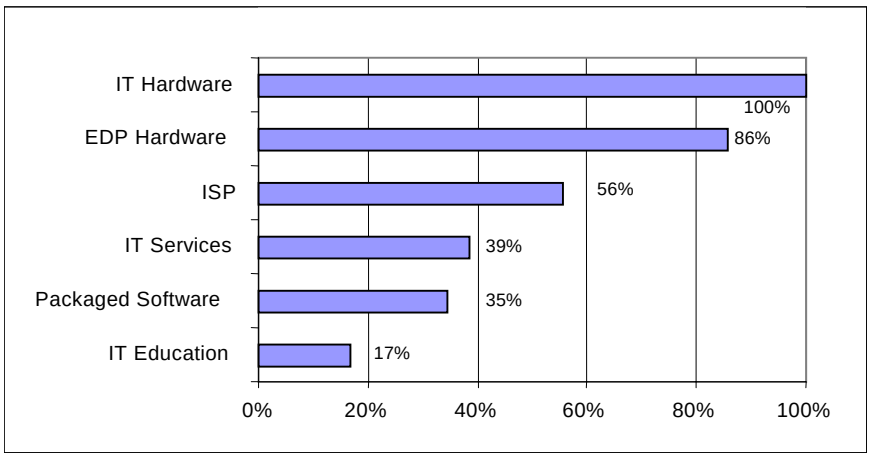
The graph below indicates the strengths and weaknesses of the organizations in their perception. The figures are consistent with the problems they encounter, i.e. low level of product marketing and advertising.

Graph 4.10.1. Strengths and Weaknesses of 100 Surveyed IT Companies



The need to increase marketing capacities of the companies is further confirmed by the fact that an average of 46% of the organizations have separate marketing departments, as follows in the graph below:

Graph 4.10.2. Availability of Marketing Department in IT Sub-Sectors



It is also to be mentioned that all foreign software companies have marketing departments located abroad in their Headquarters.

The second issue of high importance for the companies is the Management, 45% of the firms surveyed, highlighted the Management related such problems like - the lack of Financial Department (26%) and lack of a business plan (24%).
Also, the companies are concerned about unfulfilled staff needs and high rotation of personnel in the company, which speaks about low level of Human Resource Management practices. Some training is required on Company Resource Planning techniques.

Mainly IT Education, IT Service and EDP Hardware companies report problems with regard to Sales & Order Processing. Most of the companies surveyed, admitted that they do not have sales plans and are unable to close sales. This can be the direct consequence of low level of IT Marketing practices in the enterprises, and emphasizes the need for marketing training as noted above.

What regards to training activities themselves, then, - the companies show up initiatives in training as their own staff so the people from outside the organization. For example, 34% of the companies provide on-the-job training for their employees and 15% of the surveyed companies train people from the outside of the organization.

Some improvement in this field is quite tangible, as around 40% of the companies support commercial training practices. And a considerable 26 % expressed willingness to contribute more for training purposes.

The only university that recently introduced IT Marketing courses is the University of Management and Information Technologies. However, the instructors of this University need retraining for improving their knowledge in the field and the University delivers knowledge only for those students who later will be involved in marketing activities. The University does not provide any short-term retraining courses for executives or marketing staff of currently operating companies. However, exactly this kind of short training is urgently required by most of the managers of IT companies. These trainings will result in improved performance of the local companies and will strengthen the competitive advantages of Armenian organizations.

We can also make some assumptions while looking at the information on the types of cooperative efforts the companies would benefit from. The companies indicated a wide variety of activities and among them Market Access, Marketing Expertise, Management Expertise and Technical Expertise. Around 60% of the companies surveyed have an interest in at least one or even all of the fields of cooperation. Naturally, for the

implementation of joint-projects and gaining access to the international markets, the companies would require a strong expertise in Management, IT Marketing and IT Project Management. And their awareness of the issues might only be welcomed.

Based on this data we can prioritize the needs and problems:

1. Marketing (for 55% of the surveyed companies, as noted above), with emphasis on
   Sales / Distribution Strategies / Promotional Strategies
   Price Calculation / Determination
   Market Research / Segmentation

2. Management (for 45% of the surveyed companies, as noted above), with emphasis on
   Organizational Development
   Financial Management
   Human Resource Management / Organizational Behavior
   Planning of Company Resources / Managerial Economics

It is worth to provide a separate treatment on the needs of software companies. Thus, 50% of the local software companies and 30% of foreign ones experience problems in IT Management. Fifty percent and 15% correspondingly have problems in Marketing.

4.10. 2. NEEDS FOR TRAINING AND RE-TRAINING OF IT INSTRUCTORS

Due to the fact that the institutions have added 8 new computer-programming languages to their curricula in the year 2000 (thus responding to the market demand), they have faced a problem of up-grading the expertise of their IT instructors, who are specialized in comparatively old CP languages. This regards to all 209 IT Instructors (as per survey) because of the dynamic nature of IT Industry, as the CP languages become obsolete very quickly as newer versions of the latter are released.

Though, few of the surveyed IT Education institutions expressed willingness to support commercial training for their software instructors at the same time with a very moderate demand for IT instructors being at a low 7% from the current employment pool, which naturally is dictated by unfavorable conditions such as limited financial resources and insufficient facilities, nevertheless, all the institutions indicated the readiness for cooperation and collaboration mentioning such areas as Technology Transfer, Technical Expertise, Joint Research and Development (R&D) and Sub-Contracting.

Without any doubt, for the successful implementation of the above-mentioned activities and for keeping up their competitive advantages, the institutions would require a well trained „up-to-date“ staff which must be upgraded on a regular basis.

4.10.3. NEEDS FOR TRAINING AND RE-TRAINING OF CP, SA, CS/E

The table 4.10.1 below details the number of graduates from State Universities for the period from 1961 to 2001.

Table 4.10.1. Total Number of Graduates from State Universities

Period	Pure Hard Sp. SEUA	Mixed CP and Hard. Sp. by SEUA	Pure CP by YSU	Total for CP	Total for Hard. SP and CP
1961-2001	**4600**	**5900**	**2800**	**8700**	**13300**
1975-2001	**3300**	**5500**	**2800**	**8300**	**11600**
1985-2001	**1690**	**3950**	**1780**	**5730**	**7420**

Around 20% (or 500) specialists currently employed in software companies are retrained graduates of other faculties of state universities, where the courses on the basics of programming are delivered and /or have been prepared by newly established IT Education institutions (at the same time we could not obtain data from private IT Education institutions themselves on number of graduates **?!**).

For the analyzing purposes, the experts in the field advised us that the most reasonable figure to consider is the number of graduates from 1975 to 2001. The knowledge base and expertise of early (1961-1974) graduates cannot be considered sufficient for re-training. In accordance with expert opinions, students who graduated from 1975 and on are the most capable for re-training.
The number of graduates from 1975 comprises 11,600 for all specialties, which includes 8,300 for CP, SA, CS/E and IT instructors.

Table 4.10.2. Employment and Unemployment Among IT Specialists

Prepared *CP, SA, CS/E, IT HW and IT Instructors* **during 1975-2001**	**11600** (8300 only for CP, SA, CS/E and IT instructors)	**+20**%* prepared out of two state universities special faculties and other IT education institutions (~500) = **~12100** (8800 only for CP, SA, CS/E and IT instructors)
	By survey	**Extrapolation**
IT sector	1174 (130 from Chili Technologies & Boomerang, Khariskh Ltd and AtomService) + ArmenTel – 113 emp. **1287** (100+4+1 IT companies surveyed)	~**3,850** (for 222 IT companies)
By 30 Banks (including the Central Bank)	**85** (12 out of 30 banks surveyed)	**~150**
Other sectors of economy (mostly contracting from IT Services)	**62** (24 out of 110 large companies surveyed)	**~100**
Employed by the Government (including municipalities)	**50**	**~350**
Employed by International organizations (mostly contracting from IT Services)	**50**	**~50**
Employed by IT Education	120 (state universities) + 89 in other IT education Institutions =**209**	**~250**
Freelances	**40** (used snowball effect methodology)	**~150**
Total employed IT Specialists	**~1783**	**~4,700**
Left Armenia for oversees	**198** (61 Spec. & 137 Instructors)	~ 120 (IT) + ~ 180 Instructors= **~300** **~500-1000**** left before 1995
Unemployed		**~7000** (3100-3600 only for CP, SA, CS/E and IT instructors)

* According to surveyed companies, 20% of their engineer staff are specialists who graduated not from special computer faculties of two major state universities.
** CP, SA and instructors left Armenia for overseas mostly before 1995. Our survey-covered period after 1995, when state SW firms came back on the track and new private firms were established. According to expert assessment around 500 -1000 left for overseas during that time.

The number 1783 is interpreted as follows:

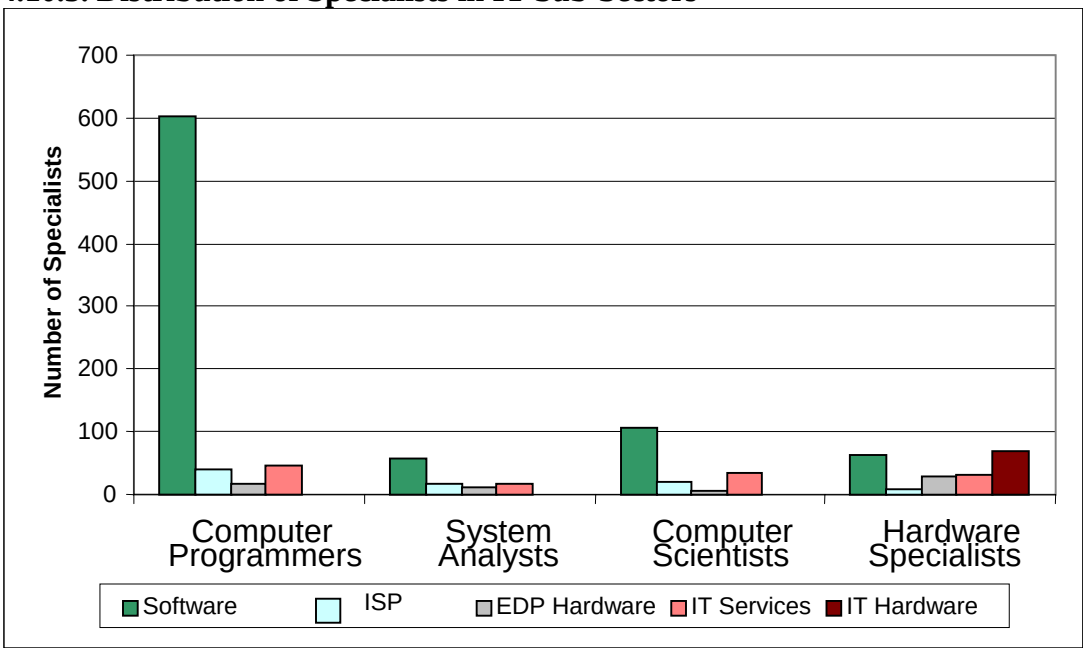
922 CP or ~52%
256 SA or ~14 %
174 CS/E or ~10%
222 CHS or ~12%
209 Instructors or ~12%

Applying the percentage factors to the extrapolated numbers we obtain:

~2050 CP or ~52%
~550 SA or ~14 %
~450 CS/E or ~10%
~500 CHS or ~12%
an approximate number of 250 Instructors

As the table shows, the current employment for above categories is 4200 (minus ~500 CHS).
Around 500-1000 specialists (mostly CP and IT instructors) left Armenia for overseas for the last decade. Therefore, the approximate number of specialists (only for CP, SA, CS/E and IT instructors) unemployed or employed not for their core specialty could be around 3100-3600.
From the extrapolated 4700 IT specialists currently employed, some 12% (or 500) are computer hardware specialists. Thus, the number of employed Computer Programmers, System Analysts and Computer Scientists/Engineers and Instructors comes to about 4200. From these 3100-3600 unemployed IT specialists around 1500 are those who graduated from the state universities after 1985 and who are now less than 40 years old and could be retrained. The market analysis finds that 40% of students of retraining institutions and those taking courses from 24 identified private instructors are between 30 to 40 years old and have the basic education. After short retraining course they could be upgraded with new computer programming languages. The same for IT HW professionals, there are at least around 1000 of IT HW specialists who graduated after 1985 and who are now less than 40 years old and could be retrained.

Graph 4.10.3. Distribution of Specialists in IT Sub-Sectors



According to experts' opinion and instructors' curricula, many computer hardware faculties in the State Engineering University also included 3-4 computer-programming courses and those graduates are easily retrained into qualified SW developers, as it is proven by 20% of programmers who work in active SW firms.
Estimated unemployment among the specialists is around 3,100-3,600 and the need for specialists is estimated to be around 1800 for IT and could be a little more if we consider non IT sectors.
IT instructors claim that the most effective re-training results for the course with the duration from one to three months (4 hours per week) for one to three new programming languages they have provided for specialists who graduated after 1985.

The first, and the most important prerequisite for organizing training and re-training courses is the fact that 61% of the companies, and nearly 28% of CP, SA and SC/E working in Software sub-sector are delivering training courses for the staff of their organizations.

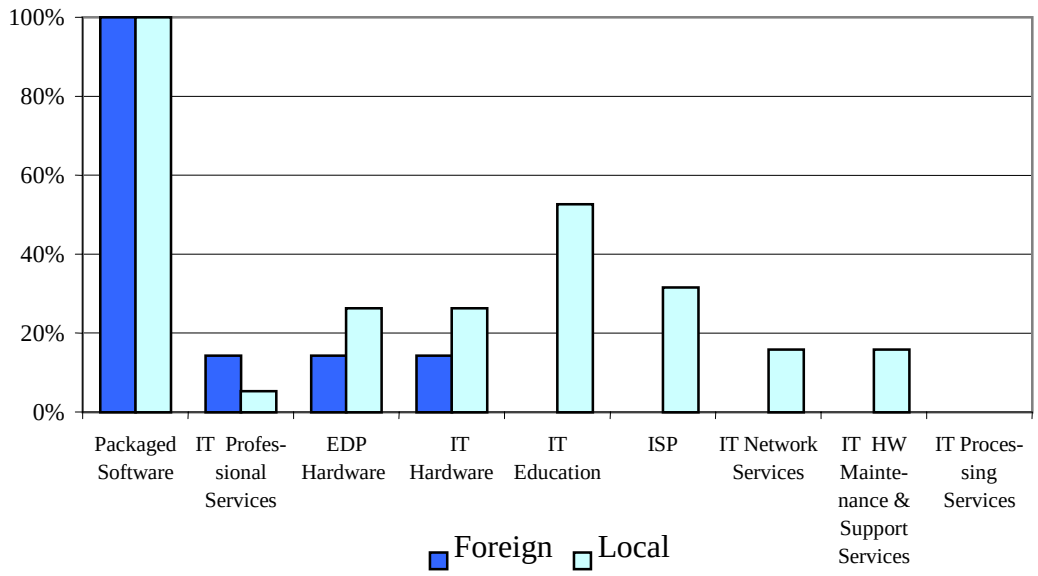
The companies have already recognized the need for staff upgrading as one of the main determinants of success.
The fact that the companies have to train and upgrade their software developers and other IT specialists speaks about inadequacy of academic education received in state education institutions. The managers of the companies admitted that considerable number of employees are either self-taught or have been prepared in private institutions or by individual instructors.
Here we can note that there is a direct relationship between the training of IT instructors and re-training of CP, SA and SC/E. Wide training programs for IT Instructors might save a vast amount of time for the companies which will not have to additionally re-train and upgrade their staff.

4.11. ITI Market Development Potential

4.11.1 SOFTWARE

The information technology market in Armenia is at its early development stage. The growth rates are not the same for each IT sub-sector, but the trends are positive. The survey revealed the software sub-sector to be the most perspective and promising niche for Armenian IT market development. The strong expansion of the software sector in 1997-2000 represents one of the brightest spots in the recent industrial development of Armenia. It is a widely held view that the sector has major potential and under favorable circumstances could produce a major spillover effect on the rest of the economy in terms of productivity and global linkages. However, not only software but also its „supporting„ sub-sectors show considerable rise since the 1995. Thus, IT Education goes in line with rapidly growing SW. The number of educational enterprises has almost doubled since 1992. All of newly established institutions are private and reflect the increasing demand on the part of SW companies.
Let us look at the market potential issues in more detail, highlighting the strengths and weaknesses of each of the ITI sub-sectors. Besides their main specialization, the companies are also involved in a row of secondary activities. The Graph 4.11.1 details the non-basic activities of foreign and local companies.

Graph 4.11.1. Main and Sub-activities of Local and Foreign Software Companies



We found it reasonable to present the differentiated graph for foreign and local companies for comparative analysis.

Software Market – Workforce, Products and Sales

Cross analysis of survey data of IT sub sectors identified that in addition to 60 companies which operate in the Software sub-sector and develop software as a basic product, there are 25 non-software companies among 74 surveyed (100 minus 26 SW), which stated that they developed software as a non-basic product and some of the companies even exported them. These 25 companies are mainly comprised from IT Education institutions i.e. about 35 %, IT Services - around 25%, about 25% are ISP companies and some 15% are EDP Hardware companies.

This has driven the number of companies engaged in SW development up to least 85 enterprises. In view of this rather interesting fact, we could assume that the number of non-software companies involved in the development and export of software products (as their non-basic product) might increase by additional 10-15 companies if we also consider the organizations not covered by the survey.

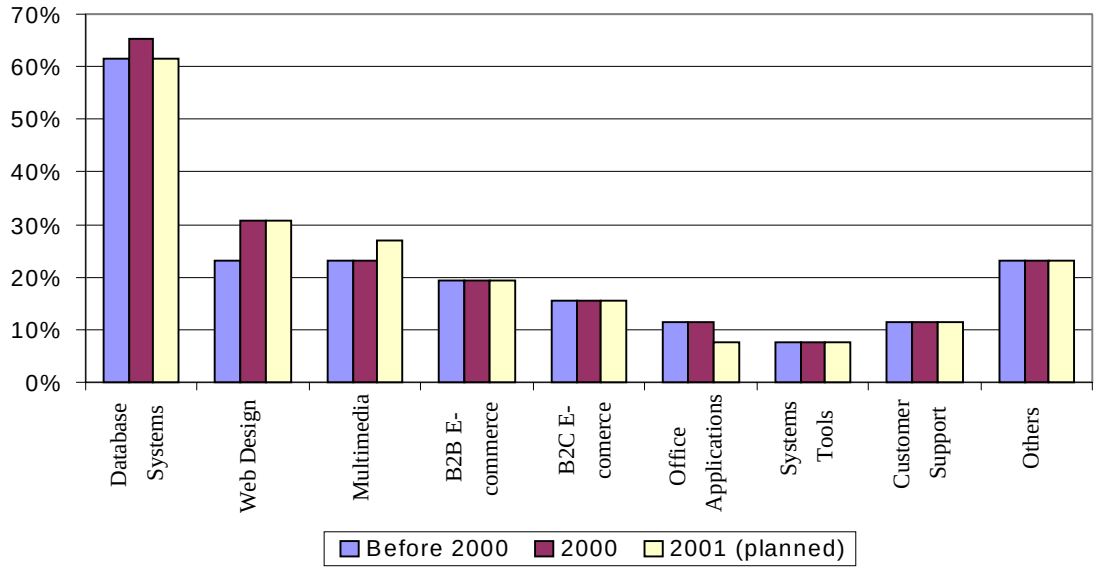
Among the existing 60 SW companies, 26 are subsidiaries of foreign IT enterprises. They can be broken down into 23 USA based companies, one company with its headquarters in the UK, another in Belgium and third one in France. All of these enterprises have recognized the potential and the talent of Armenian SW developers and have successfully been utilizing it so far.

Both these local and foreign companies are the largest employers of IT workforce. The number of jobs held in this sector amounts to around 800 within the surveyed companies. Moreover, the foreign companies hold about 60% of software developers while the percentage of theses enterprises comprises only about 45% of the total number of SW companies. Such an attention on the part of non-Armenian companies indicates the recognition of Armenian software developers' professionalism. Armenia has been the Silicon Valley of former USSR and after the collapse of the Union Armenia has got the high-tech infrastructure and R&D centres it enjoys today.

As we have already presented in the graph 4.2.3. the expansion of software companies, which is reflected in increasing average number of personnel per company (more than five fold for 5 years), resulted in the growing demand for IT skills and export of products by companies and was responded to by IT Education institutions.

Due to the broad range of specialities available in Armenia, the companies develop a wide variety of software products. These range from accounting/banking software to multimedia educational applications Database Management Systems (DBMS), Web-design, Geological software, B-to-B software, Multimedia and Educational courses, system software and utilities, customer support software. The graph (4.11.2) that follows, shows the types of SW products the companies develop.

Graph 4.11.2. Packaged Software Products by Local and Foreign Companies



Among the basic software products developed on the local market are the Data Base Management Systems (DBMS). This is due to an increasing number of businesses and continuing diversification of products manufactured in Armenia.

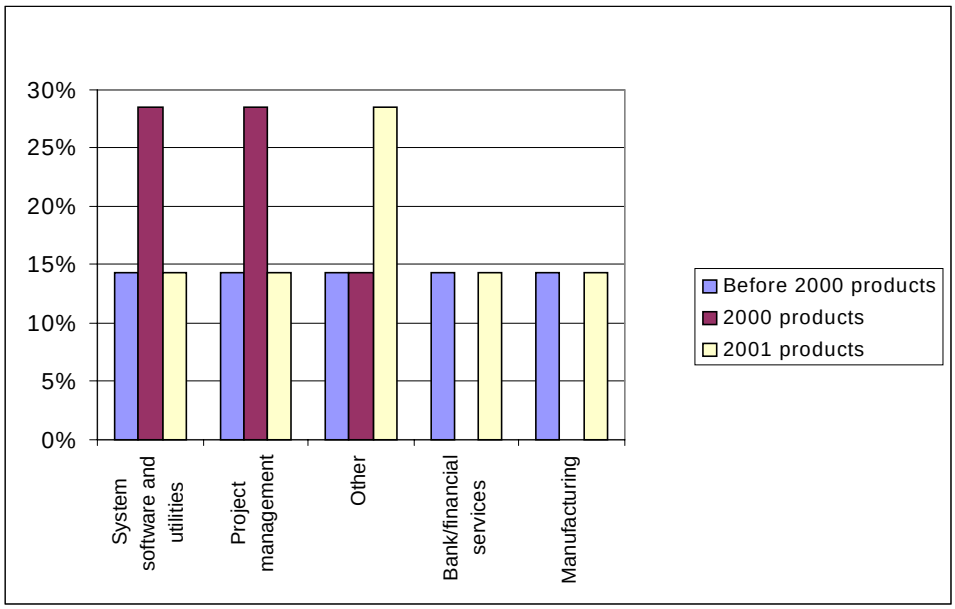
In spite of the restrictions imposed by the ArmenTel monopoly power on the development of Internet technologies, the companies are entering into the new IT field as Web-Design and Development. The market rules force companies to seek for new means for promotion of their products and the use of Internet applications and e-commerce/e-business techniques is vividly reflected in demand on their part for development of companies' web-pages and other tools closely related to Internet.

A special notion is to be made for foreign SW companies. These enterprises export their products abroad and therefore do not have local customers. The foreign companies subsidies in Armenia develop and export such products as Operating Systems, Automatic IC test equipment, secure e-business solutions, e-commerce, m-commerce SW, yield optimisation software for semiconductor industry, wireless applications and cross-platform messaging systems for clients in the corporate government, ISP, and education sectors.

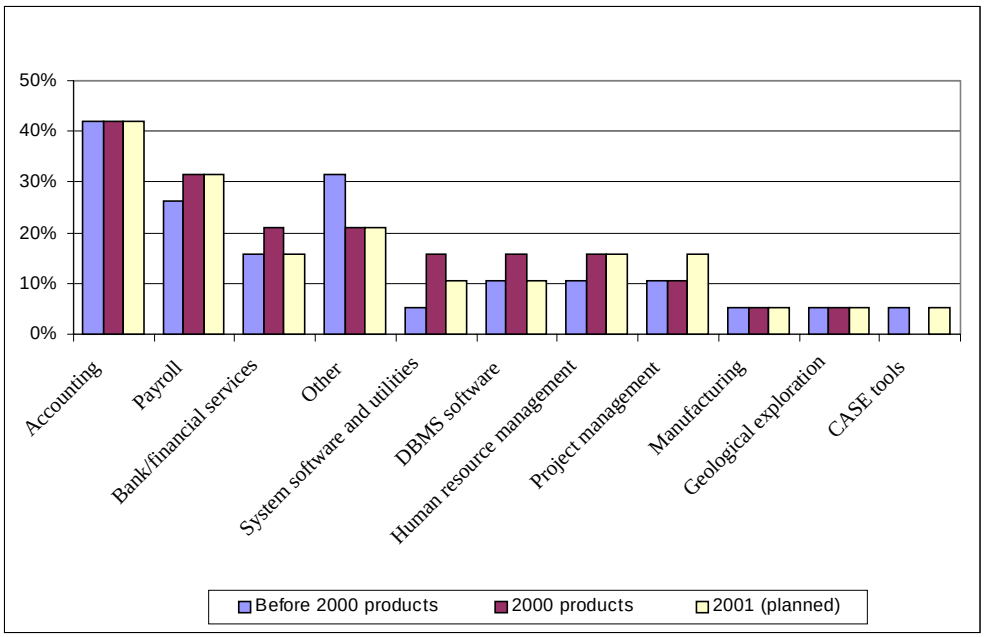
Software packages developed by Armenian companies are introduced and applied in many fields of the economy. As an example, accounting, payroll and banking/financial software packages are widespread in the financial sector. Three companies are indisputable leaders in this field of software development in Armenia.

Another direction of software development is the multimedia educational programs. The multimedia software market could hopefully serve as the basic pre-requisite for Distant Learning Courses in the nearest future along with the improvement of situation with telecommunications.
The graphs 4.11.3 and 4.11.4 that follow show the software products developed by local and foreign companies.

Graph 4.11.3. Software Products by Foreign Companies



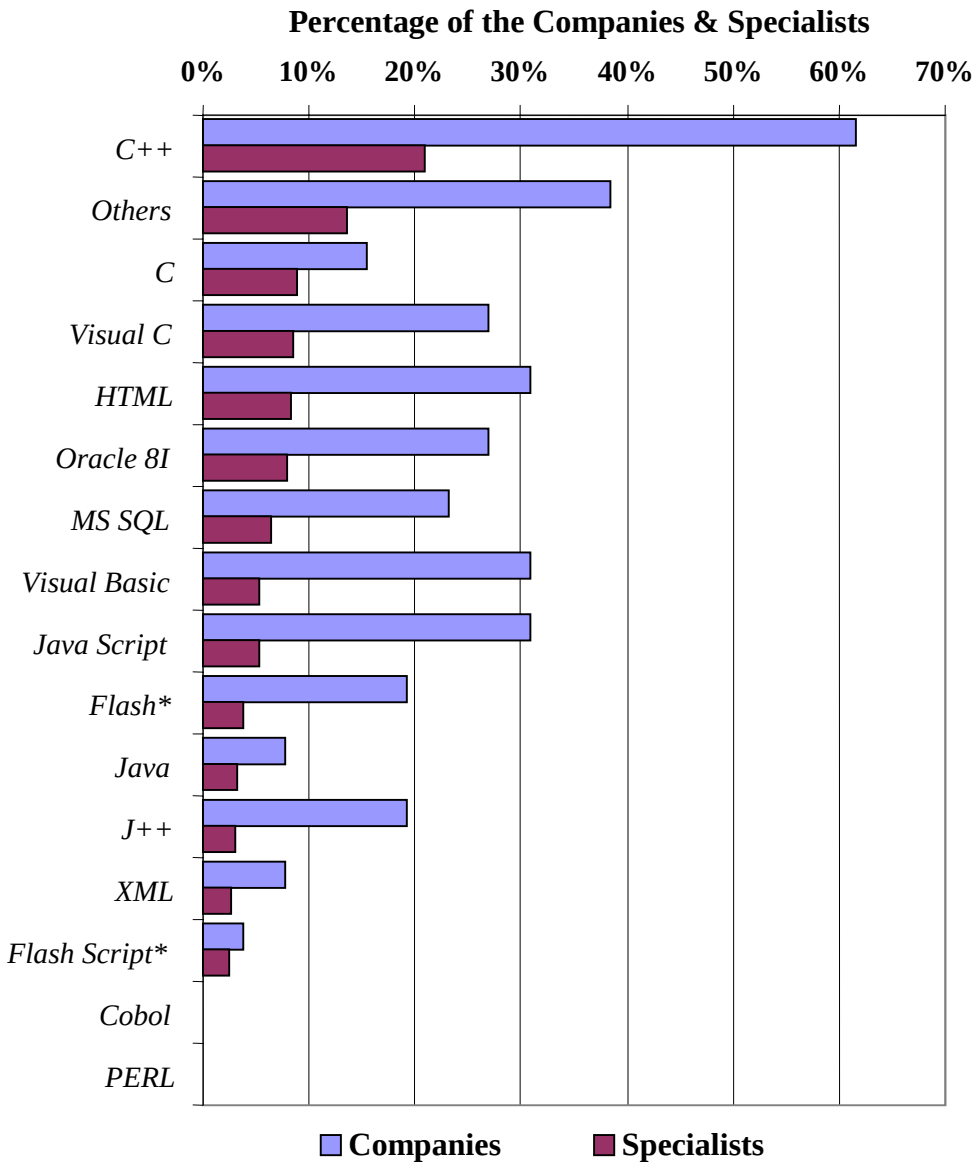
Graph 4.11.4. Software Products by Local Companies



*CASE: Computer Aided Software Engineering

The graphs 4.11.3 and 4.11.4 say that the companies are not certain what to produce even for the period of three years. It seems that local companies are working using method of „trial and error“ and along with the problems in IT Marketing we could expect such outcome.
The following graph shows the computer programming languages used by the companies.

Graph 4.11.5. Computer programming languages used by the companies



Note: * Flash and Flash Script are advanced Internet applications.

More than 60% of the companies use such universal and all purpose computer-programming language as C++. Visual C++, Visual Basic, Oracle and MS SQL are also widespread. The development of Internet technologies in Armenia has resulted in the use of HTML, Java Script, XML, Flash and other languages.
The majority of companies use Windows operating system (’98, NT, 2000). Some 25% are using Linux.

Competition

The foreign enterprises do not face competition issues in Armenia, because they sell their products on international markets and therefore cannot be related to the local market.
The local companies on the other hand start to feel what the competition is. For example the market for accounting and banking software is a very promising niche for development as more and more enterprises, as state so private are starting to use the financial software and bring their systems in compliance with international standards. The demand for these category software products will only increase thus, giving a free way for competition. Some three SW companies have established leading roles in this sector. The production of other companies is in a sense unique for the market and due to this the enterprises do not encounter competitors on the local market.

Market Share

The foreign companies are not viewed in this section, as they do not account for any local market share.

More than half of the surveyed local companies responded that they do not know about the share their products have on the Armenian market.
The answers of 3 largest local companies are very consistent with each other. Considering that these companies are the major ones in Armenia specialized in the development of financial/accounting/banking software we can assume that the market for above-indicated software products is shared like 50% / 30% and 20% correspondingly.
The market share of the rest 6 companies, with the exception of one SW company specialized in geological software (accounted for 80% of the market for Software programming for geological, geographic, and natural resources), did not exceed 15 % (for each).

Sales and Export

According to the World Bank report[21] and a study[22] conducted for that report „during 1997-99, output and export of Armenian software companies has been at least doubling each year, and in 1999 it amounted to US$15-20 million"[23]. But at the same time authors mentioned that it encompasses not more than 7-8% of the overall merchandise export as officially reported[23]). As authors of the study mentioned „estimates for sales were the most difficult to obtain. Presented figures are very approximate and may substantially vary from real picture so far as foreign owned companies are concerned. Estimates for annual sales figures including these companies vary from US$ 18 million to 20 million. Annual sales excluding foreign owned companies vary from US$ 2 to 2.5 million. While sales made by subsidiaries of foreign companies are 100% exports, in local companies' sales exports make 20-25%." As authors continue, „Estimates for growth also are considered from two perspectives: growth of software industry with and without foreign owned companies. In the first case, annual growth for the period of 1997-99 is estimated to be an average 200%. Annual growth of the industry only with local companies over the same period is very moderate compared to the latter figure and represents on average 30-40%. Companies operating in the industry also mention that over 1997-99 there was approximately a three times growth in productivity[24]."

There are other figures obtained during other study conducted by ADA[25]
Table 4.11.1. in this report presents the estimated growth of the local and foreign SW firms' turnover since 1996.

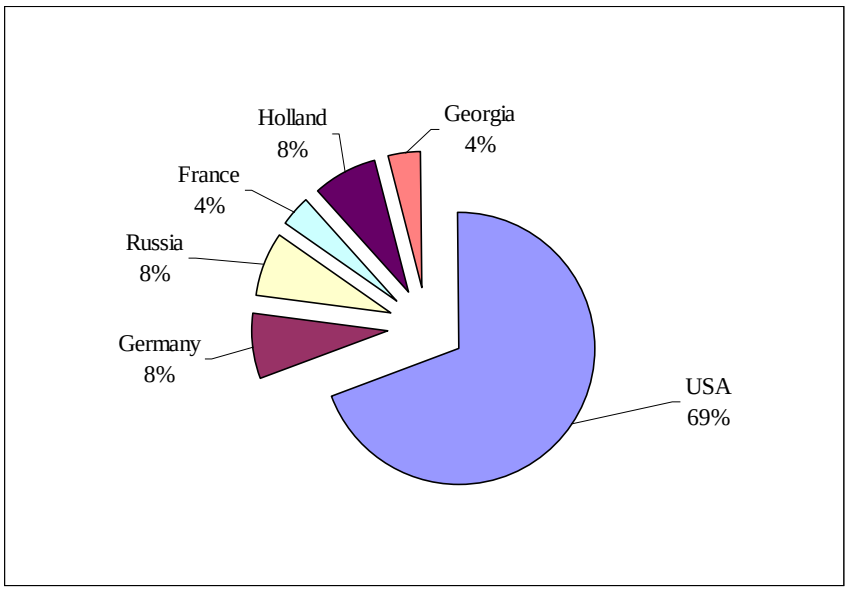
Table 4.11.1. Estimated growth of the local and foreign SW firms' turnover since 1996

Turnover in US$					
1996		**1997**		**1998**	
Total	Export	Total	Export	Total	Export
519,500	24,000	767,600	31,250	920,000	49,550

We have tried to find out during our survey, figures for 1999 and 2000, but the companies refused to provide the information regarding export and sales. The only financial data obtained is the size of the salaries in local and foreign enterprises, which is presented later on this chapter as a comparative advantage. The companies expressed their unwillingness to provide any financial data and motivated this as a result of worsening business environment.
Armenian Computer Programmers have already obtained high reputation and credibility in USA IT market. More than 60% of local software companies export their products, mainly to USA, Germany, France, Russia, Holland and Georgia. The graph 4.11.7 shows the main export destinations.

[21] Armenia: Growth Challenges and Government Policies, Part II, Main Report, Draft, April 30, 2001
[22] Alexander Poghossian and Vahram Stepanyan, Armenian Software Industry, *SECTOR STUDY,* World Bank, September 2000
[23] All numbers related to the software sector are based on indirect estimates, which in most cases derive from Poghossyan and Stepanyan (2000). The official statistics do not distinguish the software sector from other manufacturing and does produce any regular data on sector developments.
[24] Alexander Poghossian and Vahram Stepanyan, Armenian Software Industry, *SECTOR STUDY,* World Bank, September 2000
[25] Export Supply Survey by UNCTD/WTO/ADA ITC/DTCC/99/2436, 20 May 1999, page 83.

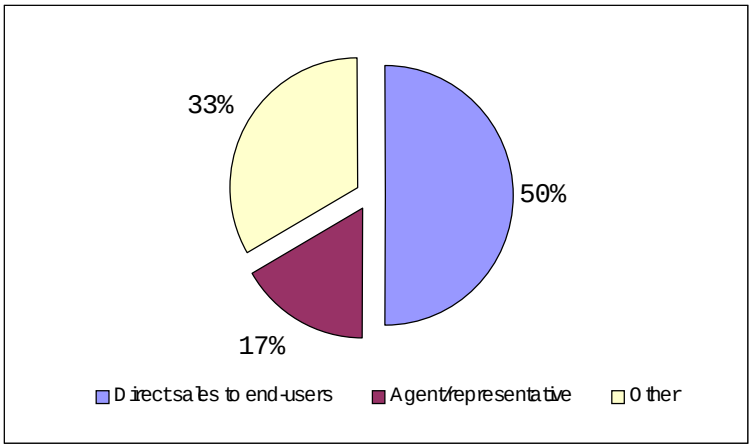
Graph 4.11.6. Main Export Destinations of Software Companies



The companies are also active in receiving Software Projects from foreign-based companies. Thus, all Armenia based foreign companies receive such projects. The projects mostly come from USA.
10 surveyed local software companies (52%) also receive such projects. The Projects come from USA, Germany, Russia, Georgia, France, Austria and Holland.

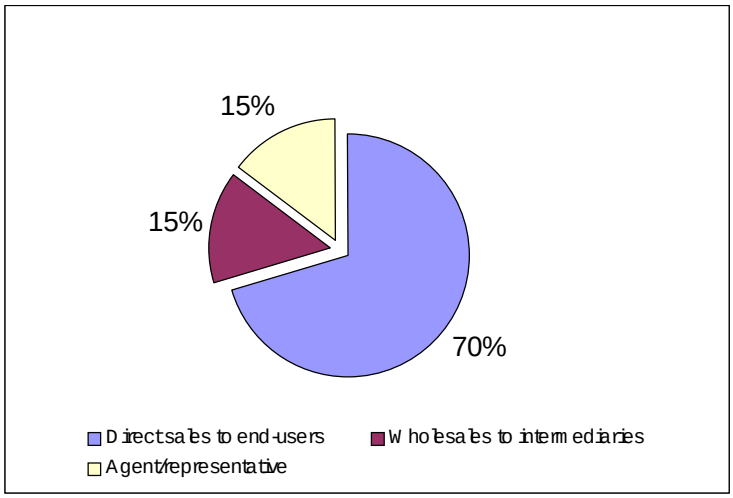
Some information is obtained about the sales and distribution channels of foreign and local companies.

Graph 4.11.7. Sales Channels of Foreign Companies



Some of the foreign companies preferred not to disclose information regarding their sales channels and replied as „other“.

Graph 4.11.8. Sales Channels of Local Companies



Strengths and Weaknesses Analysis for SW Sector

Although Armenia belongs to the countries with economy in transition, nevertheless the country can have its role in the world IT development.
The country possesses some short run comparative advantages that are not yet turned into competitive ones, such as:

- **High technical expertise of the IT professionals**.

The very expansion of software sub-sector speaks itself about the professionalism of Armenian software developers. This is further proven by the fact that foreign companies based in Armenia account for 60% of the demand for the IT skills. And these trends are highly sustainable.

Cost competitive labour force.

For comparison, the remuneration of computer programmer with up to 5 years of experience in foreign software companies in Armenia comprises $7,000-10,000 annually, while in US the similar software developer is paid from $40,000 to 60,000[26]. Based on the survey information we can state that the salaries of software developers working in local companies range from $200 to $400 depending on the expertise and experience level. This standard is considerably higher in the foreign subsidies starting for $600 and higher.
At hand we have another report by Arcas group[27] where the salaries reported are taken at a minimal value, which is used to compensate the software developer without experience.
The salaries (table 4.8.10) are correspondingly:

Table 4.11.2. Comparative graph on the salaries

POSITION	USA	UK	Greece	India	Armenia
Project Leader	79,000	57,000	36,000	35,000	4,800
Business Analyst/Consultant	55,000	54,000	43,000	32,000	2,400
Systems Analyst	70,000	49,000	23,000	21,000	2,400
Development Programmer	60,000	42,000	20,000	12,000	2,400

[26] *Information week research salary survey of 21, 398 it professionals*
[27] *„Information Technologies“ report by Arcas Group Ltd., April 2000*

POSITION	USA	UK	Greece	India	Armenia
Support Programmer	54,000	36,000	23,000	12,000	2,400
Database Data Analyst	73,000	32,000	36,000	26,000	2,400
Documentation Staff	52,000	30,000	23,000	12,000	1,200
Test Engineer	69,000	35,000	20,000	12,000	1,200

The authors of the report state that „table clearly shows competitive advantage of the Armenian IT companies in cost (the staff salaries make 80% cost of the IT company on product development)" and „taking in account high technical level and low cost of development of IT products, it can be stated that the Armenian IT companies provide the best quality/price ratio in the World"[28].

Armenian Diaspora with established networks and contacts.

One of the findings of the survey was that many people who left Armenia for overseas keep in contact with their motherland and some of them even bring orders. This is an example of how Armenia can benefit from its Diaspora. The collaboration and assistance with export activities can be provided as by new emigrants so the „old" Diaspora.

As was have already covered in the sub-chapter 4.2. in order to utilize the capabilities of newly formed Diaspora and to create market opportunities for export expansion, we have tried to identify the percentage of emigrants with possible involvement in these intermediary roles. In particular, SW companies keep in contact with 17% from total number of left specialists, and about 9% bring orders for these companies. This information confirms that Armenian companies have already begun utilizing contacts with their former employees for marketing their companies, products and attracting orders.

Experience with subcontracting.

The very fact that about 60% of the local companies are exporting their products and receive orders from abroad tells us that the companies possess some experience with sub-contracting activities, and can be considered by foreign organizations as perspective partners for skills outsourcing practices.

- **Some inherited strength of companies.**

By managers perception the strengths of local companies are in quality control, post-sale support and R&D, which are explained by the high technical human capacities of companies. In foreign firms these include production, R&D, quality control, planning and financial resources.

- **Unaffected by transportation problems**.

- **Some independence from local conditions.**

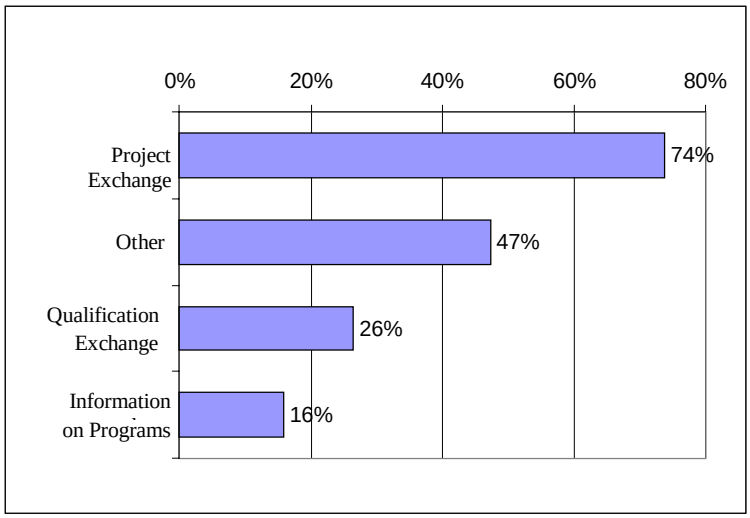
The sector **STILL** is left outside of interests of influential local clans, which substantially reduces costs of entry for new companies.

Willingness of Armenian companies to go global and expand the markets for their products.

The graph 4.8.11. confirms the willingness of Armenian companies to go global and expand the markets for their products. About 75% of local companies need information on new projects and a quarter expressed interest in qualification exchange.

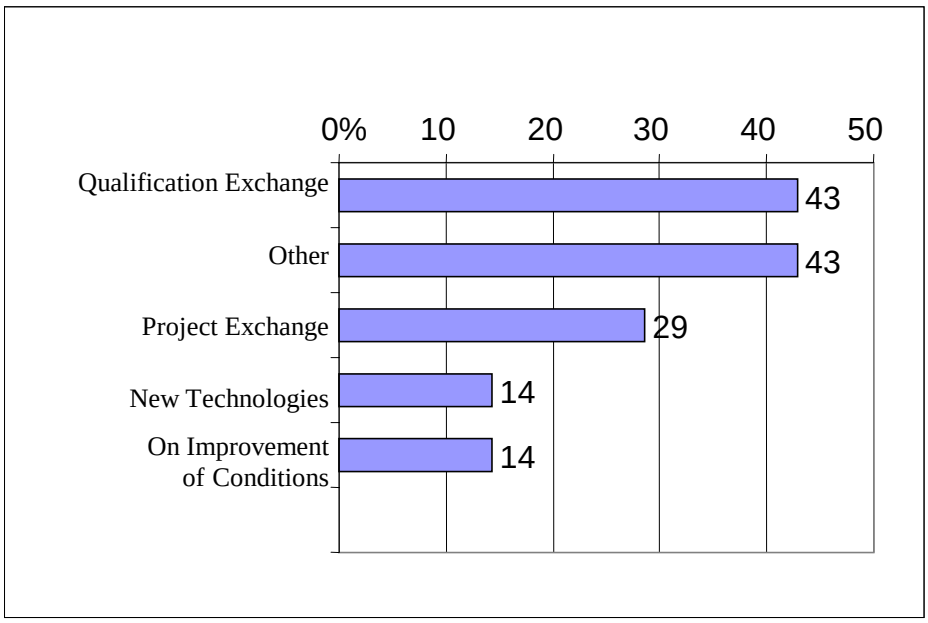
[28] „Information Technologies" report by Arcas Group Ltd., April 2000

Graph 4.11.9. Type of Information Needed by Local Companies



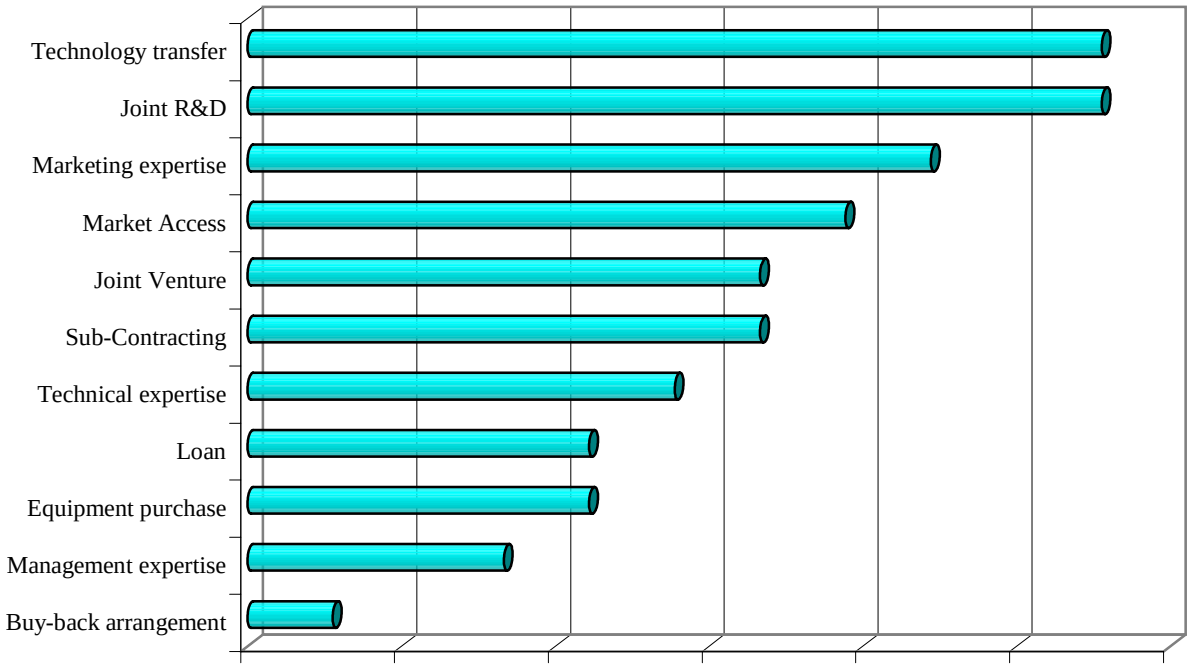
The foreign companies are less concerned about such issues as project exchange and new technologies. They are seemingly more interested in attraction of qualified programmers and other IT specialists, the main prerequisite for their success in Armenia.

Graph 4.11.10. Type of Information Needed by Foreign Companies



The companies showed a deep interest in Technology Transfer and R&D as the graph 4.11.11 says. Almost half of the companies admitted that they would benefit from collaboration in Marketing with the following Market Access, which is considered as a perspective field of cooperation.

Graph 4.11.11. Type of Cooperative Effort for Mutual Benefit



Obstacles

Although Armenia has the human potential for SW market development, there are some problems that need to be addressed to expedite the IT development in the country.

Financial Resources: One of such issues is the lack of financial resources. The newly adopted unfavorable law on Joint Stock Companies forces some enterprises to re-register as Limited Liability Companies, obviously not contributing to the venture capital development.

Telecommunications: In addition to this, enterprises suffer from the extremely poor telecommunications infrastructure. This issue does not affect the foreign companies in the extent as it does to local ones. The problem is, that most of the local software companies are connected to the WWW by „dial-up“ connection type. This seriously limits the capacities and the speed of connection. High pricing is also an issue. In comparison, foreign enterprises mostly use dedicated lines and wireless connections.

IT Marketing and Management Expertise: As introduced in sub-chapter 4.5, the local companies are seriously limited to the national borders due to the lack of IT Marketing specialists and consequent inability to reach international markets. The marketing expertise of the organizations is far less than adequate and the majority of managers do not have clear ideas or structured knowledge on IT Project Management and IT Marketing. As our personal interviews proved they are practicing method of „trial and errors“ plus their intuitions in their activities and decision-making. However, these problems are identified and addressed by international donor organizations like the World Bank, Eurasia foundation and the Master Plan of USAID.

Due to low level of product marketing and advertising (the marketing expertise and limited financial resources do not allow it), the sales are placed on the middle of „Strengths and Weaknesses“ axis. The close interrelationship between the factors proves the answers to be objective. Companies are also weak in identifying prospective international partners and clients and usually do not practice market researches.

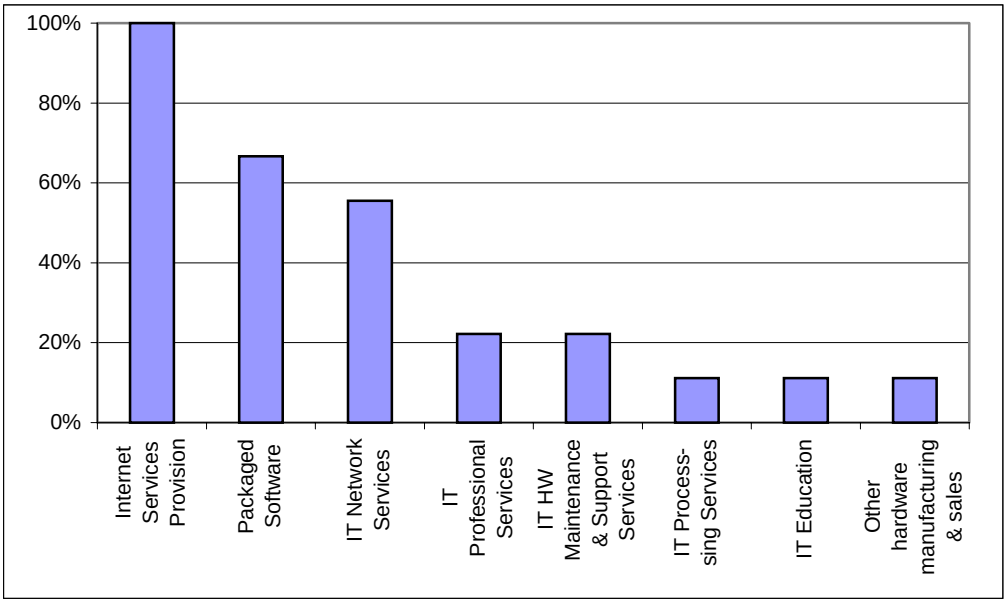
- Certain provisions of the Intellectual Property Rights legislation fall short of international standards (for details see sub-chapter .4.6) and Armenia has some steps to take in order to bring its intellectual property legislation in consistence with the TRIPs Agreement.

- Outdated software training in local universities, and a limited pool of available up-to-date programmers.
- Unfavorable business environment.
- Small size of local market.

4.11.2. INTERNET SERVICE PROVIDERS

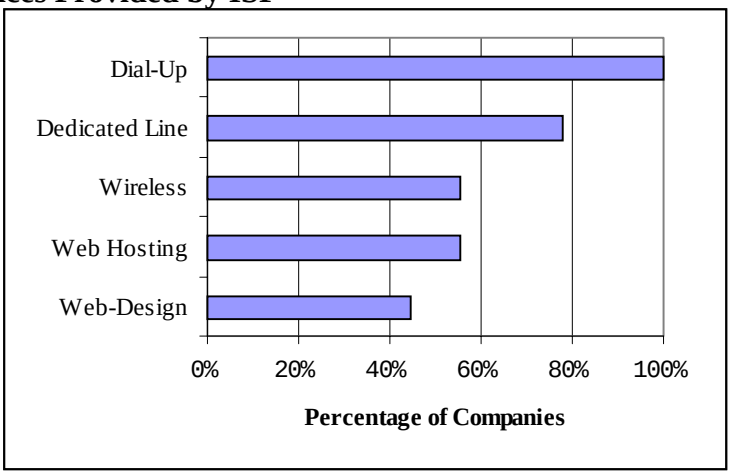
The sub-sector, which probably has the largest obstacles on its way, seems to be growing by a steady rate. The ISP companies are involved in a wide variety of non-basic activities as depicted in the graph 4.11.12.

Graph 4.11.12. Main and Sub-activities of ISP



As we can see, more than 60% of ISP companies are developing software products.

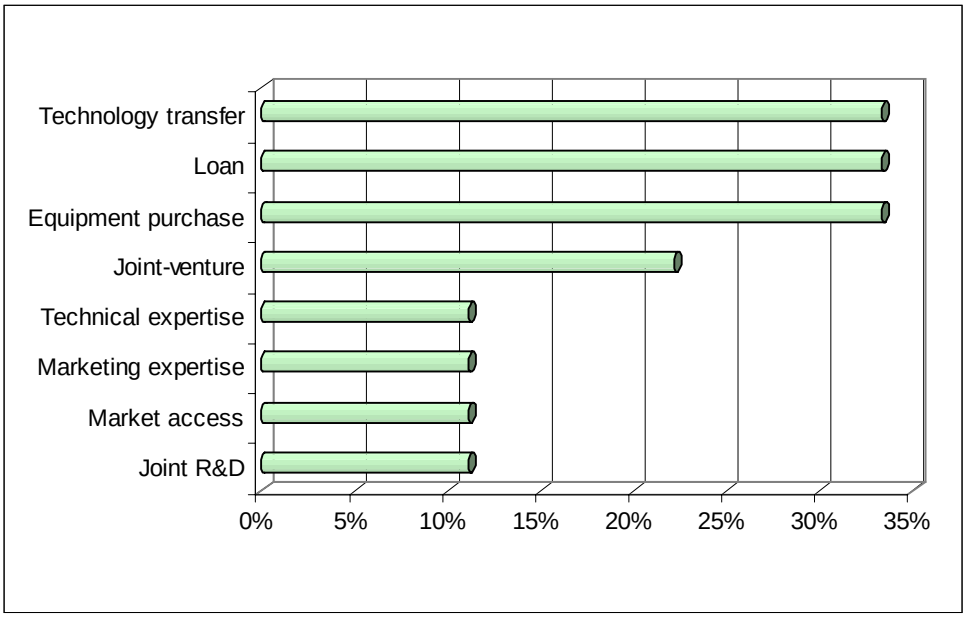
Graph 4.11.13. Services Provided by ISP



The majority of the companies provide access to the Internet via Dial-Up and Dedicated Line. According to our survey, only small number of businesses is connected to the World Wide Web via dedicated line due to its high pricing. Even fewer companies provide wireless connection, as the most businesses simply cannot

afford it. Web hosting and We-Design services are in the stage of early development and more likely will have a boost as soon as the telecommunications issues are solved.
What regards market share, then some of the companies claimed to have some 90-100% of it, which hardly seems to be real. The third part of the companies does not know about their market share they occupy.
Several companies export their services to USA, Russia, France, Germany and UK.
The only company who said they received orders from abroad was Arminco. The orders come from USA and Russia.
More than half of ISP companies expressed interest in Project and Qualification Exchange.
As it could be expected, the companies expressed interest in Technology Transfer, Loan and Equipment Purchase. The managers are optimistic about the future of the Internet business in Armenia, which is confirmed by the willingness to utilize the latest technologies and up-to-date equipment.

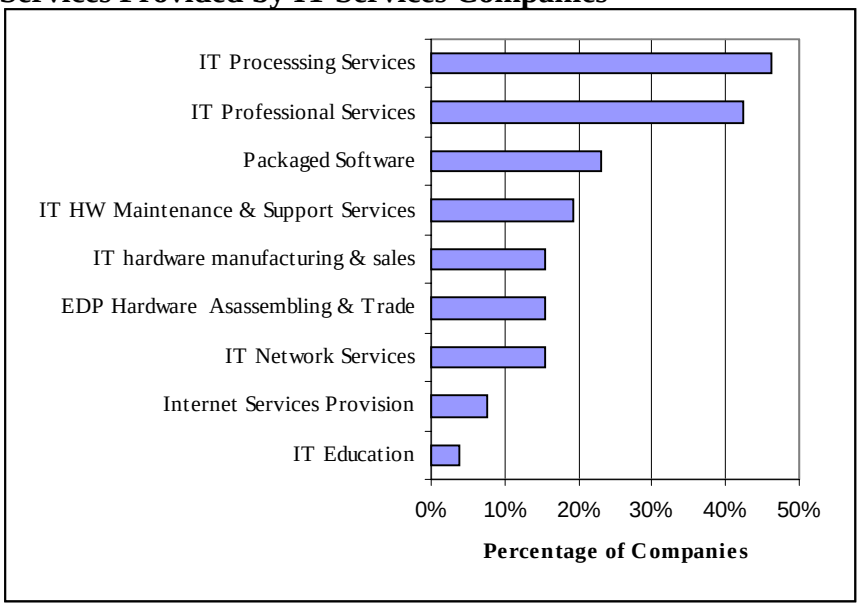
Graph 4.11.14. Type of Cooperative Effort for Mutual Benefit



4.11.3. IT SERVICES

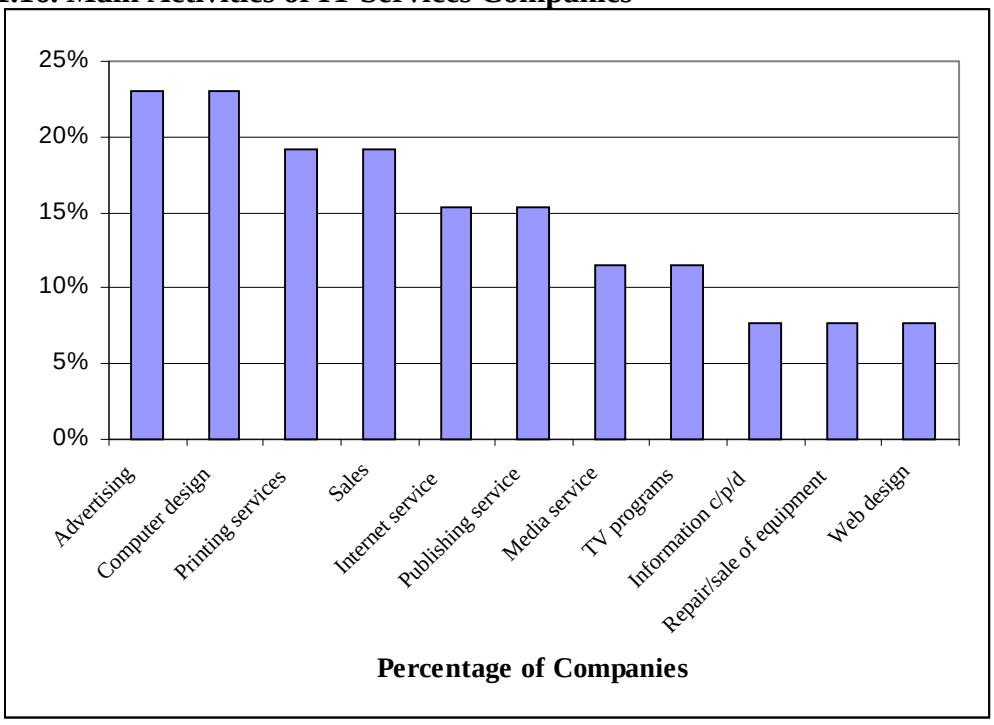
The emergency of this IT sub-sector is tightly linked to the development of other IT sub-sectors and industries of the economy. As hopefully Armenia moves into the digital age, more and more businesses become dependent upon information networks and professional consulting and services in handling IT related components of their projects.

Graph 4.11.15. Services Provided by IT Services Companies



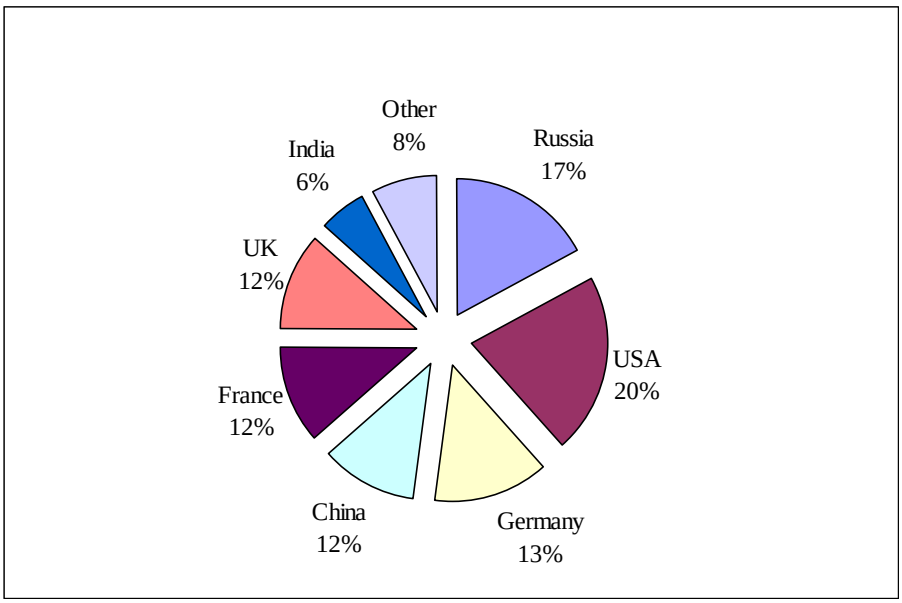
Although the graph 4.11.16 does not show noticeable trends in the development of IT Services sub-sector, nevertheless, the presence of computer design, Internet services, information collection/processing and dissemination and web-design serves as a basis for further integration of this field with other IT sub-sectors and represents the link between the IT Industry and other sectors of Armenian economy.

Graph 4.11.16. Main Activities of IT Services Companies



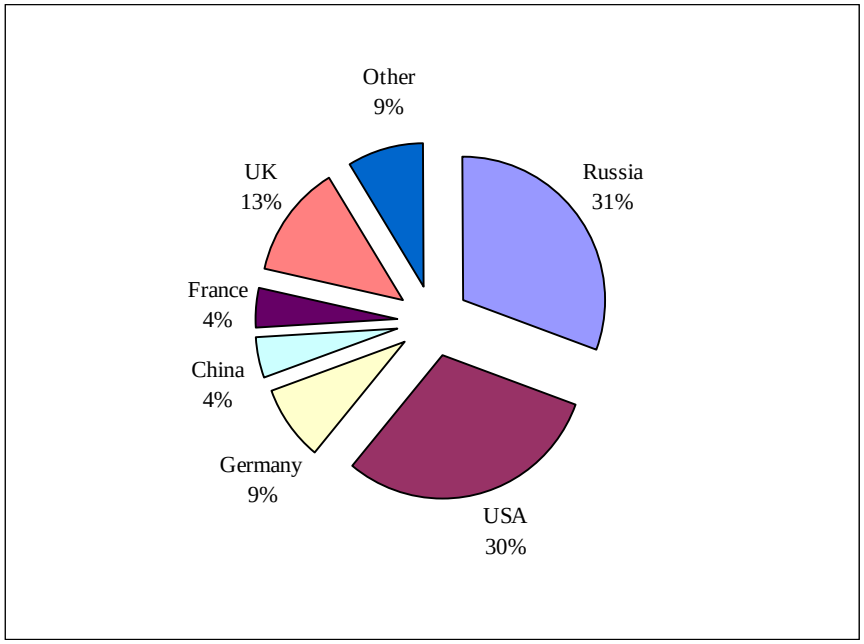
Among other services provided are: analysis, design of the television networks, international and local telephone and fax services, news dissemination, programming (accountancy), telematic service.
As with other sub-sectors, the IT Services companies are not sufficiently informed about their market share. Around 40% of respondents do not know the market share they occupy. The rest of the companies with few exceptions claimed to have 50% and more of market share, which is not sound.

Graph 4.11.17. Export Destinations of IT Services Companies



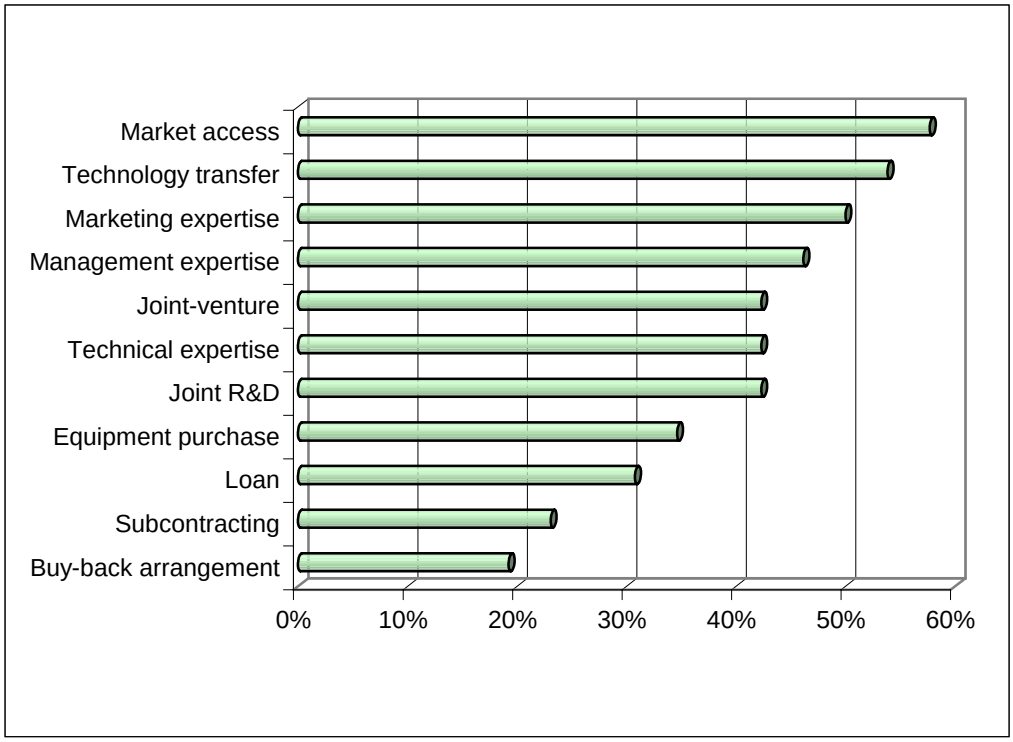
The companies are exporting their services to the countries detailed in the graph 4.11.17. This is a good indicator of the dynamic nature of this field and growing professional capacities of the companies if they succeed in attracting foreign customers and partners.

Graph 4.11.18. Home Countries the Orders Come From



The graph 4.11.19 states that the companies feel open and ready for collaboration in many fields. In particular, we should emphasize the interest in Marketing and Management expertise, which accounted for 50% and 45% correspondingly.

Graph 4.11.19. Type of Cooperative Effort for Mutual Benefit



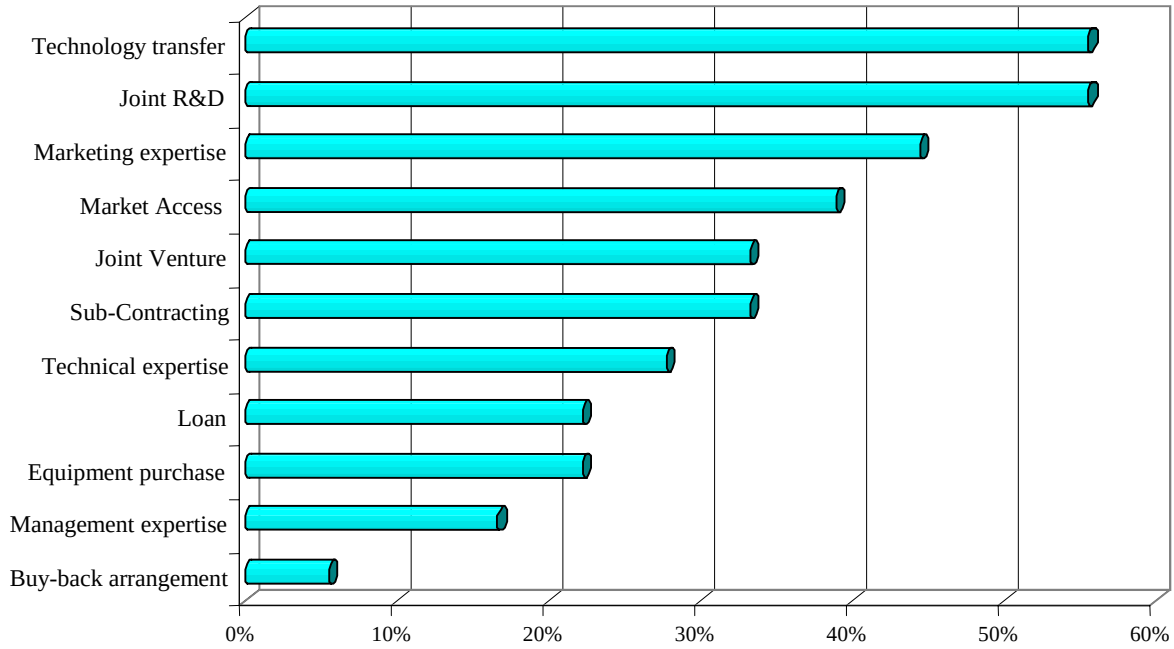
4.11.4. IT EDUCATION

The detailed information on the types of products and services offered by IT Education institutions is provided in the sub-chapter 4.3.
Here we bring the information with regard to export activities of the institutions. Ironically, IT education institutions could be considered as the major „exporters" of IT specialists and IT instructors within IT companies.

Around 50% of the institutions are engaged in the development of software products. This statement is confirmed by the fact, that some 40% of the enterprises receive orders from foreign countries such as USA, Germany, Russia, India and other countries. The country destinations for software products' export are: USA, Germany, Russia, France, United Kingdom, China and other countries. These can be thought of as a considerable success, in view of the fact that only 3 institutions have separate marketing departments with the total marketing staff of 22 people.

Also, the reported lack of marketing expertise and shortage of marketing staff further proves that the enterprises are in their early stages of the development of marketing and sales practices.
The very fact that the institutions comprehend the need for developing marketing skills and practices and are eager to work synergistically can be considered as a first and the most important sign of growing market potential. The graph below vividly shows that the considerable part of the institutions are interested in cooperation for mutual benefits. Such spheres of cooperation as Technology Transfer, Joint Research and Development and Marketing Expertise are the „Hot Issues" for the field of Armenian IT education.

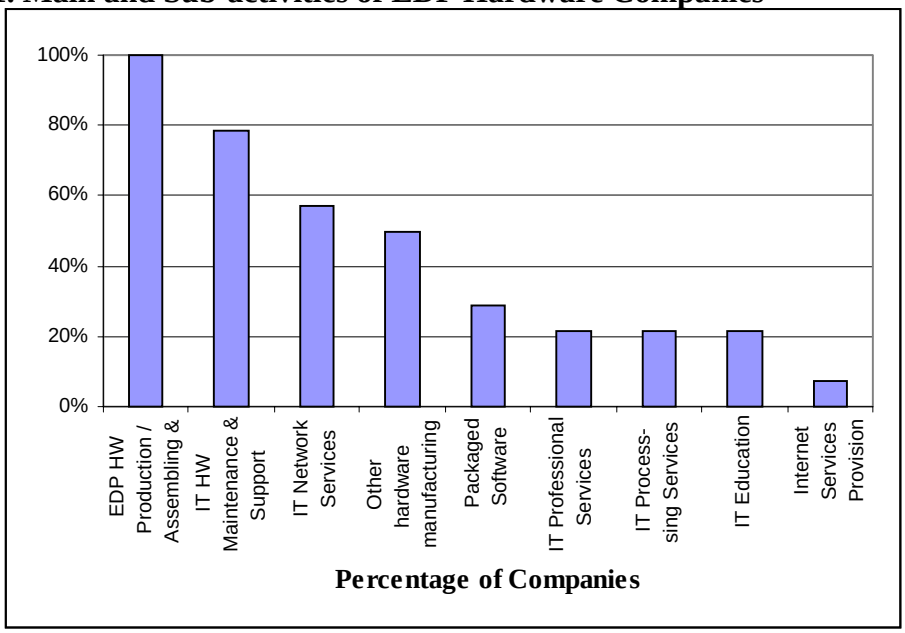
Graph 4.11.20. Type of Cooperative Effort for Mutual Benefit



4.11.5 EDP HARDWARE

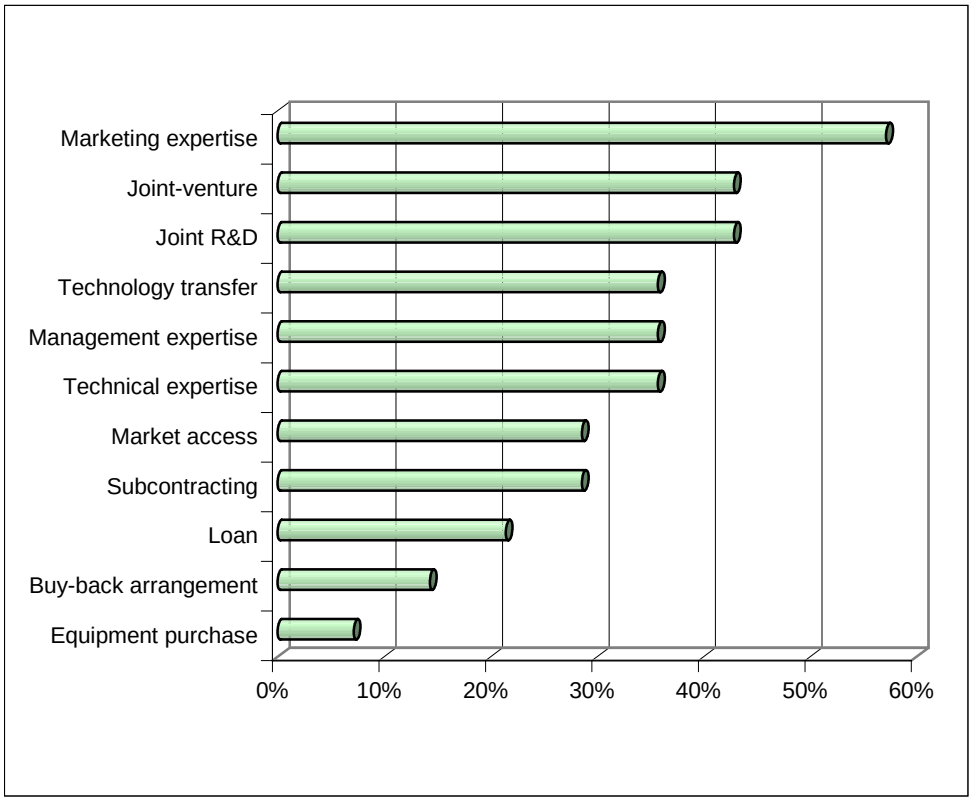
Among the sub-activities of EDP Hardware companies we find packaged software development, IT professional services and IT Education.

Graph 4.11.21. Main and Sub-activities of EDP Hardware Companies



About 70% are authorized resellers, dealers and distributors of such well know foreign companies as Intel, IBM, Cisco, Dell, Asus, HP and others.
Also, 70% of the companies are selling their products to the wholesale intermediaries, and 85% distributing the PC's servers and other equipment directly to end-users.

Graph 4.11.22. Type of Cooperative Effort for Mutual Benefit



4.11.6 IT HARDWARE

Very little can be said about this sub-sector. Most of the enterprises operate at an extremely low profit margin. Due to very old equipment and lost markets these companies are more a burden to the economy than perspective contributors to the well being of the economy. None of the companies has Internet access, and the number of computer hardware they possess is negligible. No company has expressed an interest for cooperation or other joint activities. There was only one among surveyed companies exporting its products. The following table presents the specialization of IT Hardware companies (as per survey).

Table 4.11.3. Company profile (IT Hardware)

Main products and services						
We produce according to orders	Electro-measurement equipment	Productions of calculators	Different radio-electronic equipment	Different types of relays	Production of different resistors	**Total # of companies**
1	1	1	2	1	1	**7**
14.3%	14.3%	14.3%	28.6%	14.3%	14.3%	**100%**

For the lack of information, the detailed treatment on the potential of IT Hardware is not provided within the scope of this analysis.

CHAPTER V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions on Major Problems and Potential for ITI Development

As proves the information obtained from the survey, even with unfavorable business environment and current infrastructure (telecommunications, particularly related to Internet) constraints, the Armenian IT industry performs relatively not bad growth. Two factors contribute to such performance: first of all, the ICT growing dynamics in the world with some impact on IT industry in Armenia and inherited potential and current willingness of Armenian emerging IT industry and its workforce to find its own niche in the worldwide development.
Identified and described above problems could be sorted into four major groups of obstacles, which adversely affect IT industry development in Armenia:

Some issues of regulatory framework, deficiency in its enforcement and its administration;
Infrastructure problems – poor telecommunications, mostly Internet infrastructure, with high prices; low capacities and speed, poor quality of connection, low level of security and service;
Lack of alternative Military Service, which is worse that brain drain of young IT specialists and weakens strategic development of IT firms;
IT Education and re-training problems.

Solutions for the first three mentioned obstacles do not require relatively long-term efforts. Their improvements are mostly concentrated in the government decision-making power and could be easily solved or conditions could be tangibly improved upon political will.

IT educational issues consist of three problems: a) improvement of managerial and marketing skills, b) preparation and re-training of IT Instructors and c) re-training and preparation of workforce. All these issues asked for long-term efforts by all partners in the field: the government, industry, educational institutions, donor organizations and NGOs. The first noted issue could be considered as the most effort and time consuming, due inexperienced managers which fail to operate effectively in the market economy and some level of resistance against new knowledge. At the same time around 64% of managers have already realized that they desperately need systemized and structured marketing training (according to our analysis 55% of companies need that) and much less, about 30% of managers admit that they need management training (our analysis gave 45% of companies in need).

At the same time there are trends that could be considered as a promising potential for ITI development in Armenia:

Slow, but growing number of exporting IT companies, mostly software, also the noticeable expansion trends of other IT companies into the field of software development;
Diversification of contracts and orders received and export destination countries;
Diversification of activities, products and services to catch market demand;
Growing demand for IT specialties, mostly computer programming and application use by IT and non-IT companies;
IT educational institutions slowly, but respond to the market demand for training and retraining of IT specialists;
Growing demand for high quality IT education, mostly Computer Programming and System Analysts and other computer related specialties;
Growing demand for Internet services.

There are a lot of other minor inputs to the IT development potential by the IT industry, other industries, IT workforce, the economy, educational institutions, society and other interested parties that separately could not be considered as real potential, but all together could be thought of as a real power for mobilization of efforts in ITI development.

5.2. Recommendations

We present recommendations in such an order that we perceive could be easy solved.

1. With regard to regulatory framework, its enforcement and its administration

AmCham already presented to the government the justification and draft amendments for improvement of intellectual property rights and UITE joined it efforts to this lobbying process with its developed draft amendments.

The Customs Inspection of The Republic of Armenia does not consider Packaged Software as a product. According to the Legislation only computer equipment is subject to 10% import tax. Since the Software is not classified as a separate product, the importers pay customs for the computer equipment according to the certain terms (Packaged Software Products are imported with electronic mediums). Due to this fact, they pay 30% customs for the imported Packaged Software products (10% customs and 20% VAT), this resulted in preliminary expensiveness of the products and as a consequence they become unaffordable for Armenian enterprises. This is why it is very important to adopt the International classification for products and services, where the Software Products are included, unlike the Armenian classification. This will allow to draw up the Customs documentation on imported and exported computer Software.

In accordance with the legislation in force, Armenian enterprises are allowed to spend 0.5% (it means if spending exceeds 0.5% then, more will be spend from the profit) of their gross revenue on market research, sales promotion and similar activities.
Comparing with the experience of western countries we can conclude that 30-35% of the basic cost are spent on the product development and services, the remaining part constitute the costs associated with the product sale (market research, advertising and etc.) we can conclude that for the development of ITI, this margin is too low. Taking into consideration the specifics of ITI (Information Technology Industry), i.e. the basic costs mainly comprise market research, sales promotion and similar expenses, it is necessary to review the 0.5% margin (it is suggested to increase it up to 80%), that is to amend the tax legislation, thus allowing the enterprises to include also into the price of the product the costs on market research, sales promotion and similar activities, if not completely then at least partially.

The research of the ITI state in RA showed, that the majority of the active companies are registered as Ltd. Taking into consideration that most of the companies are newly established, it was supposed that they should be established as a stock companies having opportunity to attract capital in the market.
The reason is the unfavorable law on Joint Stock Companies and legislation called to regulate security market.

Law enforcement and administration problems are similar to the problems of other sectors of economy. Recommendations for their improvements are already elaborated and presented to the Government and we do not repeat them here.

2. Infrastructure problems – poor telecommunications, mostly Internet infrastructure, with high prices, low capacities and speed, poor quality of connection, low level of security and service.

The Government is taking actions to improve the situation, but it seems new players should enter into the negotiation process between the Government and ArmenTel in the quality of intermediaries in order to make the talks more effective. The Board of UITE expresses its readiness to accept this position.

3. Lack of alternative Military Service, which is worse than the brain drain of young IT specialists and weakens the strategic development of IT companies

Intensive consultations are under way among the parliament, the government, the industry, political parties, NGOs and general public in working out mechanisms for introduction of alternative military service in Armenia within next three years as one of the requirements of the membership to the Council of Europe.

4. IT Education and re-training problems

There are many measures worked out for IT education development by international donor organizations. The government in its turn assigned the Ministry of Education to develop a program for IT education in Armenia. The recommendation we would like to bring here is to re-focus programs and first of all to concentrate on management and marketing training for operating companies' top-level management and re-training of current workforce. Although USAID and the World Bank have included components on improvement of management issues in their programs and the Eurasia Foundation has initiated the program on development and establishment of the certified center on re-training of current workforce, we would like again to prioritize issues on strengthening of management and marketing skills of operating IT companies' managers and marketing staff and introduce more support re-training programs for unemployed IT workforce.

5. Additional recommendations

Any campaigns like IT trade fairs, IT conferences, publications in newspapers and magazines, focusing on the awareness of the average citizen about the benefits and opportunities they can yield from using IT for his/her problem solving should be supported. Other events related to IT are also highly recommended to raise public awareness on IT industry and information society.

DEFINITIONS AND TERMINOLOGY

Detailed Standard International Trade Classification Codes (SITC) for Information Technology Agreement (ITA WTO) Products[29]

Products	SITC codes	Description
Semiconductor	7764 7763	Discrete semiconductor devices and integrated semiconductor devices. Commonly, transistors, thyristors, diodes, hybrid circuits, microprocessors, memories, A to D and D to A converters, A to D amplifiers and a host of microchip components which form the building block of any electronic system.
EDP (computer hardware) and data communication equipment and IT/Computer Services	7521 7522 7523 7526 7527 7529 7599	Large, medium and small-scale systems including input/ output device, storage devices and data communication equipment. In common parlance, personal computers, work stations, multi-user servers, keyboards, monitors, printers, modems, LAN cards, hubs, routers, serial and parallel ports, multi-media accessories, cables and other peripherals. **Computer software**: packaged software in diskettes, magnetic tapes and CD-ROM; software services like development of applications, on-site services, training and other services, customization of applications, reengineering/conversion and IT consultancy.
Office equipment	7511 7512 7633 7513 7591 7638	Electronic typewriters, electronic calculators, electronic cash registers, electronic accounting machines, dictation equipment and photocopiers.
Telecommunication equipment	7643 7641 76491 76481	Line telephony/telegraph transmission apparatus, radio telephony/ telegraphy receiver, parts and accessories, switching equipment, fax machines, transmissions equipment, telephone sets, other telecommunications equipment, accessories and parts.
Other components	7762 7768 7711 7712 7789 7723 7722 7724 7725 7731 8984	Color television tubes, monochrome television tubes, other display tubes, capacitors, resistors, connectors, plugs and sockets, electrical circuits, switches, transformers, chokes, coils and PCBs.

[29] Trade in Information Technology Products and the WTO Agreements. Current Situation and Views of Exporters in Developing Countries. ITC, UNCTAD, WTO OMC, Geneva, 1999.

Products	SITC codes	Description
Scientific, medical and other equipment/Other miscellaneous products	7788 7648 8748 8743 8744 8747 5985	Measuring and checking devices, chromatographs, spectrometers, optical radiation devices and electrophoresis equipment and other miscellaneous equipment.
Semiconductor manufacturing equipment	From 66591 to 88136	A variety of equipment and testing apparatus used to produce semiconductors like vapour deposition apparatus, spin dryers, etching and stripping apparatus, laser cutters, sawing and dicing machines, deposition machines, spinner, encapsulation machines, fumaces and heaters, ion implanters, microscopes, handing and transport apparatus, measuring and checking instruments and parts and accessories.

Software[30]

The term „software“ refers to both the instructions that direct the operation of computer hardware and information content, or data, that computers manipulate.

Software products are commercially available in packaged programs for sale or lease form systems vendors and independent software vendors. They do not include specially designed application software solutions added by turnkey systems houses to systems acquired from hardware manufacturers or other third parties. The primary categories of software are: systems software and utilities, application tools and application solutions. The term „software“ may include license fees partially intended for software maintenance, services and/or support.

Systems software and utilities consists of software programs designed and developed to operate hardware through basic operating systems and programming languages, increase the efficiency of systems personnel through system performance measurement tools and improve the operating capacity of hardware system by routing the flow of data among machine units. They may also be designed to ensure program integrity through maintenance and security programs and conversion of programs from one language to another, organize data resources and monitor machine usage.

Application tools are programs that allow users to retrieve, organize, manage and manipulate data and databases. This group can be divided into four subcategories, namely: data access/retrieval, data management, data manipulation and program design/development. It includes all database management systems (DBMS) software; decision-support and executive information system (EIS) programs; spreadsheets; computer-aided software engineering (CASE) tools; and object management applications development tools.

Application solutions software includes programs designed to provide packaged solutions for specific problems inherent in an industry or business function. Software of this type can address cross-industry functions such as accounting, human resource management, payroll, project management, word processing or specific industry solutions for vertical markets such as banking/financial services, manufacturing, health care, geological exploration, etc.

IT or Computer Services

IT or Computer services sector can be subdivided into a number of components, namely professional services, processing services, network services and hardware maintenance and support services.

[30] Information Technology Services. A handbook for exporters from developing countries. ICT, INCTAD, WTO OMC. Geneva 1998.

Professional Services include contractual services for system and/or software development, systems design, integration, installation, related training/education, facilities management and consulting services specifically for information technology purposes. Professional services can be subdivided into six categories, namely:

Requirements analyses, planning and strategy studies, as well as needs assessment for projected IT services and equipment. Such studies can often include IT audits of hardware, software, personnel, security and workflow;

Systems design, which includes planning the development of IT systems;

Contract programming and custom software development services. These involve the compilation of codes to create or customize software programs. Custom programming may entail either the development of an entirely new application or the customization of an existing package software product. They can be offered either on a turnkey or per diem basis for application design, development, integration and documentation;

Systems and network implementation and integration;

Management and administration of large services contracts;

Education and training.

Processing Services are mostly bureau-type services that are usually classified problem solving or transaction processing. The problem-solving services include man-hours spent on systems providing access to computer software tools, models or specific applications. Transaction-processing services give access to a wide range of applications, which may include:

Text keying
Telemarketing
Voice applications
Coding
Batch processing
Electronic or desk publishing
Legal and medical records transcription
Car rental agency forms
Health insurance claims processing
Image assisted data entry
Mailing lists
Coupon fulfillment
Micrographic indexing
Text editing
GIS data entry and maintenance
Raster-to-vector image correction for engineering applications
Payroll and pension investment files
Desktop publishing

Network Services are defined as chargeable value-added services. They may include:

Managed network services;
Network-processing services;
E-mail;
Electronic data interchange (EDI);
Value added transport services.

Hardware maintenance and support services. For statistical purposes, hardware maintenance and support services defined as services for maintenance, repair or replacement of computer systems software including data communications equipment and other hardware support services such as disaster recovery, site planning, installation and reallocation. Maintenance may comprise on-site maintenance, time and materials and parts for self-maintenance and/or depot services, provided either under service contract or on a non-contractual basis. To avoid double counting, the statistical category specifically excludes all software support services.

Terminology Used[31]

Who are Computer Programmers?

According to the Bureau of Labor Statistics, computer programmers write and maintain detailed instructions that tell computers how to execute their functions (USA Bureau of Labor Statistics, 1997). Some examples of job titles include software developers, database programmers, programmer analysts, and web developers.
These are individuals who list in logical order the steps a computer follows in order to work. The emergence of the Internet has opened numerous new venues for programmers and created a demand for several new languages, including Java, C, and C++. The year Y2K conversion problem also has increased the need for programmers skilled in mainframe languages such as COBOL.

Who are Systems Analysts?

Systems analysts are the problem solvers of computer technology. They use their skills to address the individual computing needs of an organization—to solve business application problems. This solution may involve creating new computing systems or finding new ways to apply existing systems to meet the need at hand.
Systems analysts may also be involved in connecting the multiple computers within an organization so they can communicate with one another—networking. Networking ensures that computer systems are compatible with one another and are able to share information that is important to different users (USA Bureau of Labor Statistics, 1997). Today's new client/server hardware and software and Internet–based applications have significantly increased the demand for systems analysts. Examples of systems analysts job titles are **systems integrators and network administrators**.

Who are Computer Scientists and Engineers?

Computer scientists and computer engineers often perform many of the same duties as other computer professionals, but they are distinguished by a higher level of theoretical expertise and innovation, which they use for solving complex problems and creating new technology (USA Bureau of Labor Statistics, 1997). In general, computer scientists design computers, find ways to improve the use of computers, and look for new areas in which to apply computers. Computer scientists may include database administrators, computer support analysts, and specialists such as theory or language developers. Bureau of Labor Statistics define computer engineers as a sub-category of computer scientists. These are the professionals who are responsible for designing and developing both packaged and systems software and hardware. They may design new computing devices or computer–related equipment. Computer scientists and engineers may be employed in academics or private industry.

Other IT Specialists

EDP Hardware Specialists[32] - computer hardware and data communication equipment developers, maintenance and support services providers.

Hardware Specialist [33]- other than computer hardware developer, maintenance and support services providers.

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[31] Assessment Of Rationale For The Establishment Of The It Park In Armenia. Prepared by Dr. Victor Brjabrin UNIDO Expert, January 2000
[32] Trade in Information Technology Products and the WTO Agreements. Current Situation and Views of Exporters in Developing Countries. ITC, UNCTAD, WTO OMC, Geneva, 1999.
[33] Trade in Information Technology Products and the WTO Agreements. Current Situation and Views of Exporters in Developing Countries. ITC, UNCTAD, WTO OMC, Geneva, 1999.

Information Society

Information technologies and communication are bringing about an industrial revolution based on information, on the scale of which rocked the 19th century. These technologies and the advances of digital electronics are now allowing the creation of new multimedia telematic services and applications which combine sound, image and text and for which all means of communication - telephone, telefax, television and computers - are used in a complementary way. The development of these new means of communication represents an element of increased competitiveness for enterprises and opens up new perspectives in terms of both work organization and job creation. The diffusion of these new technologies at all levels of economic and social life is thus gradually transforming our society into an "information society".

WORLD ECONOMY DEVELOPMENT DIRECTION AND BACKGROUND OF IT DEVELOPMENT IN ARMENIA[34]

Globalization of the world economy has resulted in development of information economy. The analysis of last decades development proves that breakthrough economic development could be reached by only those countries the economic development of which is already based on competitive advantages of knowledge, information and productivity, but not on comparative advantages (availability of natural resources, inexpensive labor, fertile soil etc). For such development, Armenia has certain and promising prerequisites and because IT is the basic technology for Information economy, the development of IT industry could become the very tool to grow in this direction.

1. The Structure of IT Sector

Information technology is defined as any form of technology, both hardware and software that can be used to handle information.

ITI consists of three sub-sectors of software, hardware, and media for collection, storage, processing, transmission, and presentation of information.

Software (this sub-sector is also named IT Services sub-sector or Software and Computer Services sub-sector) consists of:

- Package software: systems software and utilities, applications tools and applications solutions
- Professional services
- Processing services
- Network services
- Hardware maintenance and support services

The second sub-sector Hardware consists of the following elements:

- Electronic data processing (computer hardware and data communication equipment) (EDP Hardware)
- Office equipment
- Telecommunications equipment
- Semiconductors
- Semiconductor manufacturing equipment
- Scientific, medical and other equipment
- Other components

The third sub-sector covers all other products related to ITI that exist already or will come in the market and does not covered by two mentioned sectors.

Along with to this already formed and structured sector there have emerged, sustained and are explosively growing the Internet and e-business.

2. IT Global Market: Size, International Trade and Trends

The global market size for IT products in 1996 was estimated at $1,188,14 billion and it is expected to extend by 12-15% per year and is projected to reach to total $1,815.5 billion by the year 2000, which according to estimation will account for 4.7-5.0% of the world GDP. According to WB, it is estimated that information added in manufacturing products will account for 60% of world GDP in 2000.

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[34] The text mostly correspnds with an article - Viktoria Ter-Nikoghosyan. „Building Up of Information Technology Industry in Armenia –ITI as Priority Sector“ International Conference „INTERNET AND SOCIETY“, July 27-28, Yerevan, Armenia, pp. 44-63.

[35] European Information Technology Observatory (EITO) yearbook 1997.

[36] Information Technology Services, ITC, Geneva, 1998.

[37] Inegrated Circuit Engennering Corporation, Inegrated Circuit Industry- Status 1996, European Economic Internet Groupin, European Information Technology Observatory 1997.

[38] Information Technology Outlook 1997

The main market driver for developing and expanding this market is computer hardware and IT services (software and services). The portion of IT services in that market will be valued 25% ($450,85 billion) in the year 2000, with computer hardware it will valued $936.75 billion, taking almost half - 49% of the world IT market.

The international trade in IT products exceeds the combined world trade in agriculture, automobiles and textiles. Global exports of IT products in 1997 amounted $681 billion and imports $618 billion. The countries/areas that accounted for over 90% of both export and imports during 1997 are the following (the order is given in the decreasing volume): USA, Japan, European Union, Singapore, Malaysia, Republic of Korea, China, Thailand, Canada, Hong Kong (China) It should be noted that both Singapore and Hong Kong (China) are important regional trade hubs and their imports and exports reflect this rather then the strength of their manufacturing industries or consumer demand in their respective countries.

3. Development Trends of Internet Economy in the World

The Digital Divide is growing. We have all heard a great deal about the digital revolution and how telecommunications and the Internet will change the world. Estimates project that between 1998 and the year 2003, the world's connected population' to conventional wire line and wireless telephones - will almost double, reaching roughly 1.7 billion subscribers. And the Internet revolution is progressing at an even faster pace. Cyberspace has clearly attained critical mass — a point beyond which there is sustained, explosive growth. There are more than 300 million people connected to the Internet. But it's important to remember that less than 4% of the Earth's 6 billion people are connected yet. In two years time, well over half a billion people will be connected. Over half of the online population is American. But that will change quite quickly as the Internet takes off in Europe and Asia.

The Internet has many uses, but e-business is the „killer application". It's a feedback loop: e-business fuels the adoption of the Internet, and that creates yet more business opportunity.

The dependency of firms, markets, products, and services on Internet growing permanently. Firms can increase their productivity and management efficiency by installing networks among their facilities and markets. Companies can beat out their rivals by using the Internet to create new sales channels, new digitized products, or new features that enhance or supplement existing products. The explosive expansion of Internet makes clear and strong understanding that it is important for everyone and every firm to be represented there. Internet and based on it e-business have become the most effective and reliable business approach.

The Internet is like the medieval Town Square or ancient agora, but on a global scale. It's a space where people interact and do business with each other. Businesses, as always, want to be where customers are, and buyers are attracted to marketplaces with lots of merchants.

E-business, is simply the use of Internet technologies to facilitate trade and business processes. It includes but is broader than e-commerce, which is the use of Internet technologies to buy and sell goods and services or to intermediate the process.

E-business brings together customers, suppliers, employees, and other stakeholders in ways that have not been possible before. It is disruptive because it enables, then forces, businesses to improve customer service, reduce time to market, and become more cost effective.

In 1999 e-commerce revenues amounted to some $250 billion. When you add in the Internet-related revenues of the companies that provide the hardware and software infrastructure, that make e-commerce possible, you get a total Internet economy of over half a trillion dollars. That's 68% higher than for 1998, and the e-commerce portion has more than doubled.

All these developments need software support. Transition and developing countries with limited fixed infrastructures will be able to participate in cyberspace for the first time. Fast, mobile, anywhere-anytime Internet connections will be commonplace. The marginal hourly cost of Internet connections will approach zero. All forms of media will be digitized and converge on the Internet.

Momentum builds quickly and leads to explosive change. Armenia has a unique opportunity to catch the momentum and find its special places in this explosively growing unlimited market, based on it educated, easy skilled, creative, innovative, flexible and productive labor-force. Moreover, e-commerce gives the very opportunity to utilize Armenian's busyness intermediary attitude, capability and skills developed during centuries.

4. Driving Forces for IT Services Market

[39] International Trade Center, Geneva, 1999.

The global market for IT is rapidly expanding. The market for IT services has had an average annual growth rate of 8% over the last decade, creating many opportunities for firms in developing countries. There are a number of global market drivers, which are currently influencing the growth rates of international trade in IT services in many developing and transition countries. The most significant are:

globalization;
global skills shortages and outsourcing;
business re-engineering and enterprise resources planning as firms try to enhance their business competitive advantage factor;
the Year 2000 (Millennium or Y2K) problem;
European Economic and Monetary Union
the merging of telecommunications and computing, which has resulted in the rapid growth of the Internet.

For Armenian ITI development it is important to take into account the global skills shortages and outsourcing as the main driving force.

The global shortage of IT trained personnel is continuing to worsen. This situation afresh increasing opportunities for developing and transition countries to supply IT services. Many IT sectors are having problems in maintaining staff levels. The demand for legacy application [40] programmers for work on the Y2K problem, for example, is such that it cannot be met in many industrialized countries, with the result that an increasing number of major IT firms are either having outsource some of their work offshore, set up offshore facilities or their own in selected developing or transition countries or hire contract staff from abroad.

Rather than correcting legacy systems for Y2K problem, many firms are re-engineering their business processes and installing Y2K –compliant systems. This is creating a very large demand for specialists IT personnel, which now cannot be met in many industrialized countries. The United States of America reported a shortage of 346,000 IT-trained persons at the end of 1997, while shortages in Europe were estimated at 165,000 persons. Upon the request of the Ministry of Industry and Trade of Armenia, the UNIDO consultant's market study reports, that in USA 346,000 IT positions were currently vacant in three core IT occupational clusters (programmers, systems analysts, computer scientists/engineers). There were 129,000 vacancies in 5,874 IT companies and 217,000 vacancies in 97,733 non–IT corporations with more than 100 employees. The 346,000 vacancies in the three core occupational clusters represented 10 percent of the total reported number of current core IT employees (3,354,000), or about 3 vacancies for each company.

The estimated number of broadly defined IT vacancies was 606,000. The difference in number of vacancies between the global response (606,000) and the three core areas (346,000) is believed to represent the increasing diversity of IT positions in such areas as sales, technical writing, customer service, and training. Latest 1999 estimation of the Bureau for Labor Statistics (BLS) shows dramatically growing demand for IT workers: (BLS) projects that the U.S. will require more than 1.3 million new skilled IT workers for core occupations over the next ten years--an average of 140,000 new workers per year. To mitigate the problem it increases the H-1B visa cap from its current limit of 65,000 to 95,000 in 1999, 105,000 in the Year 2000 and 115,000 in 2001 and 2002 for IT specialists. This does not and will not solve the problems and firms mostly relying on outsourcing.

Digital convergence between voice and data has led to rapid levels of growth in the multimedia, electronic commerce and communication industries, which are consequently experiencing shortages in trained personnel.

5. Necessity to Develop ITI in Armenia

The rapid development of IT and its impact on every sector of economy is making IT industry the very basic (as energy sector) industry for any developing economy. It is taking strategic importance in narrow meaning as the defense infrastructure and in broader, as the main tool to strengthen country's economy and increase its competitiveness in the international market.

This industry is the most perspective sector, which could play a leading role in the country's long-term economic development and have a great impact on other sectors of economy. Information Technology and its infrastructure is crucial for any country to operate successfully in the global marketplace. In addition to the fact that IT industry's infrastructure is absolutely necessary for all other industries development, all components of IT serve as a magnet for investment, both domestic and foreign. Thus, IT industry development is considered to play three-fold role in Armenian economic development: as the prosperous sector of industry itself, as a mean for other

[40] An application, ususally on mainframes or minicomputers, in which a company has already made considerable investments.

sectors development and as the infrastructure for investment. Moreover, another factor ITI development could be considered as, its a tool for transforming the economy from industrial one to the information economy.

Armenia should deeply understand that it will pay the highest cost if stays away from this development. Without rapid and successful reforms, Armenian economic development will fail in many aspects: local products will fail in competitiveness in international market, manufacturers could lose market shares, because of very simple reasons as being unable to access the global trade networks and compete on equal conditions. R$D for new products could not be effective because of a lack of access to international scientific networks.

6. ITI Development Direction in Armenia

Based on analysis of the current stage of six defined sub-sectors of ITI in Armenia and the obvious success of software, IT services and IT Education, the first support should be focused on these sub-sectors. Another extremely important sub-sector is ISP, which needs special promotion and attention. Development and expansion of these sub-sectors ask for the least capital investments and at the same time create necessary prerequisites to broaden state support for other sub-sectors. Software and already developed portion of IT services will have the fastest influence on development of other IT services and e-commerce.

7. Successful ITI Development Prerequisites

Armenia was one of the most technologically developed republics of the former Soviet Union with a special emphasis on the development of IT industry. There were about 40 R&D centers acting in this field, the biggest of them, Yerevan Research Institute of Mathematical Machines had more than 10,000 employees and produced both hardware (mainframes, computers for the Soviet defense industry) and software (operating systems, applications). Correspondingly, the country possesses a significant number of computer programmers. Most of them are graduates from the State University of Armenia and the Engineering University. Many of computer programmers worked on defense projects in the past.

The recent 10 years of instability in the region have had a negative impact on the transportation dependent and primarily export-oriented Armenian industries, but had much less influence on the local software manufacturers. After the electricity supply shortages of 1991-1994 followed by mass privatization and the establishment of private companies – end users, the country's software sector is back on track again.

According to the preliminary studies performed by independent observers, Armenia has a great potential for developing a strong presence in the world's ICT industry. With a population of 3 million, Armenia has an educational and cultural infrastructure, which helped to create a relatively large corps of qualified ICT professionals, mostly software developers, currently grouped within a number of small companies. According to the survey, conducted by Union of Information Technology Enterprises[41] (UITE) there are 222 ICT firms in Armenia.

8. ITI Meets Criteria for the Priority Sector

ITI met all criteria to be recognized as the priority sector for Armenian economic development. The criteria are the following:

- **To have a large and unrestricted export potential;**

Information Technology has the most dynamic and fast growing global market with increasing manufacturing and export capacities in developing and transition economies. Total exports of IT and telecommunication products were valued over US$ 300 billion in 1996. The market for only software is expected to increase to $450 billion by the year 2000. Export of IT products from Economies in Transition reached at US$ 6.0 billion in the same year. This sector represents one of the most promising export growth areas for the business community in countries with transition economies.

- **To create new jobs;**

It is estimated that there are about 5000 actively working qualified IT specialists, while there are approximately 3,100 – 3,600 other IT specialists that are largely unemployed or employed only occasionally. The majority of these people are graduates of the State University of Armenia and the Engineering University, with a relatively high educational background.

[41] The State of ICT Industry in Armenia. Yerevan, Armenia, May 2001, Conducted by UITE, support for this project provided by Eurasia Foundation, with funds form USAID.

- **To utilize available qualified human resources;**

Idea of taking programming and IT services contracts abroad is quite popular in the USA and other Western countries. There is no need to prove it; only detailed conditions are to be discussed.

- **To have multiplier effect on other sectors of economy;**

All anticipated impacts are described above.

- **To be attractive to foreign investors;**

The IT manufacturing industry is expected to continue relocating to areas where it can operate cost effectively. While developed countries are likely to maintain their core competencies in high-technologies areas, developing and transition countries will find opportunities in attracting investments in outsourcing and skill-intensive sectors such as Research and Development (R&D), software applications and services, repair, maintenance, installation, commissioning and the production of components.

The Internet will have a significant role in the continuing globalisation of the world's capital markets. In an increasingly interdependent world, businesses want access to the world's capital; investors and venture capitalists seek worldwide opportunities. A future of globally linked stock exchanges that are open for business 24 hours a day, 7 days a week is not far off. Pressure will increase for internationally accepted accounting standards and a global framework for securities regulation.

- **To have minimum dependency on current semi-blockade and associated transportation problems;**

IT products have the minimum relation to physical transportation (mostly virtual) and even this minimum cannot affect the prices.

- **The sector's products have to have the highest value to volume/weight ratio;**

- **To support Armenian integration and raise its competitiveness in the world markets.**

Software, IT services and Internet companies are international almost by definition. The sector recognition as the priority, will boost Internet development, which is the basis for e-business and e-commerce and will facilitate Armenia's integration into the world market. Its influence will encourage restructuring, re-engineering and upgrading of other sectors, which is the prerequisite for raising their competitiveness. Moreover, the Internet will change the whole society toward information one. Everyone and every firm can take role in the world activities. Because everyone uses the same technology, different relationships form within the business ecosystem. The top-level manufacturer might reach way down in the supply chain and deal directly with a new company that has an innovative technology.

In other words, most of obstacles and problems faced by other sectors either do not exist in the IT industry at all or could be easily resolved.

9. Regulatory and Administrative Environment for ICT Industry Development

To boost the ITI development on the policy level, in December 28, 2000 the Government by its Decree recognized IT industry as a priority sector of the economic development, both in supporting IT's own growth and in terms of contributing to the development of other branches of the Armenian economy. As the result of the Decree, enforcement of the regulatory environment should be improved and changed and the concept and program of ITI development with focusing on these problems is under development. Though the ITI sector in comparison with other branches of industry and economy bears minimum legal and regulatory obstacles and administrative barriers still exist and the ITI development program is assigned to address them.

Along with obstacles in Copy Right Law, and absence of laws on e-commerce and electronic signature and so on (drafts are in discussions) as the ICT Assessment of USAID report[42] has concluded there are at present several constraints that limit Armenia's broader leveraging of ICT's in support for economic development. These are primarily in the areas of Internet access and legal restraints that do not support leveraging of Internet for advancing in the area of E-Commerce.

According to USAID ITC Assessment, „the situation with telecommunications in Armenia can be described with two dominant elements; 1) a struggling economy with low per capita GDP with relatively modest demand for telecommunications services, and 2) ArmenTel, a monopoly provider with a virtual lock for 13 more years on the nation's connectivity. In the short term it appears that the potential opportunity for leveraging

[42] Republic of Armenia: ICT Assessment, *15 July 2000 Version, SETA*

Telecommunications as a tool for bringing about social and economic improvements will be shunted. ArmenTel will most likely continue to price its services at higher, profit-maximizing pricing levels, and continue to invest at below optimal levels to expand their Telecommunications infrastructure. While the Ministry of Post and Communications has the legislative authority to regulate the Telecommunications Sector, in fact ArmenTel is the Telecommunications Sector and they have obtained an exclusive position in this market.

Simply put, ultimately this situation needs to change. If left as it is will continue to retard economic growth. It will continue to be an obstacle for encouraging Foreign Direct Investments (FDI) into Armenia by the high-tech sector—a sector that holds some promises for Armenia but also requires high-level and reasonably priced connectivity. This problem is well understood by a broad cross-section of both private and public sector organizations and individuals. However, as yet there does not appear to be the political will to address this situation directly. While in itself this is not a „silver bullet" that will solve everything, it is of such importance that if not addressed, it will significantly limit the success of other initiatives where telecommunications is an important component."

10. Social Benefits of ITI Development

The ICT sector is notable for its amazing dynamism, both in technology and market development. This sector has a huge growth potential and is therefore a valuable source of employment and economic growth in its own right. More significant, the ICT sector increasingly underpins wider economic growth and competitiveness, having the potential to transform not just business model but social structures too, and in this, all-pervasive influence, which is enshrined in the concept of Information Society[43].

The emergence of the global information society has in effect proven to be an instrument for increasing productivity, enhancing information, knowledge and services in many ways.

> In the business world for instance, it has fostered competitiveness, efficiency and the globalization of economy. Increasingly it has brought the means of productivity and management to public administration thereby enhancing services and responsiveness to citizens.
> For consumers, the development of the Internet and electronic commerce has led to an unprecedented increase in the choice of goods and services.
> In the educational sector, training methods have been substantially revolutionized with the advent of distance-learning and multimedia applications.
> Information Society applications will help the integration process itself by providing efficient tools services and management methods to smooth the political, administrative, social, and economic problems that the accession raises.
> These are some of the many benefits the information society has brought to societies globally, which continues to take momentum.
> Furthermore, the digital convergence of media and content, the pervasive penetration of the Internet and the emergence of the "digital economy" are shaping our future towards to the new "networked society".

There are 10 priority areas for action with ambitious targets to be achieved through joint action by the Government, industry and the citizens of Armenia. These areas of action should be:

1. Armenian youth into the digital age: bring Internet and multimedia tools to schools and adapt education to the digital age.
2. Cheaper Internet access: increase competition to reduce prices and boost consumer choice.

[43] Information technologies and communication are bringing about an industrial revolution based on information, on the scale of that which rocked the 19th century. These technologies and the advances of digital electronics are now allowing the creation of new multimedia telematic services and applications which combine sound, image and text and for which all means of communication - telephone, telefax, television and computers - are used in a complementary way. The development of these new means of communication represents an element of increased competitiveness for enterprises and opens up new perspectives in terms of both work organization and job creation. The diffusion of these new technologies at all levels of economic and social life is thus gradually transforming our society into an "information society".

3. Accelerating e-commerce: speed up the implementation of the legal framework and expand the use of e-procurement.
4. Fast Internet for researchers and students: ensure high speed access to Internet thereby facilitating co-operative learning and working.
5. Smart cards for electronic access: facilitate the establishment of Armenian-wide infrastructure to maximize uptake.
6. Risk capital for high-tech SME's: develop innovative approaches to maximize the availability of risk capital for high-tech SME's.
7. "e-Participation" for the disabled: ensure that the development of the Information Society takes full account of the needs of disabled people.
8. Healthcare online: maximize the use of networking and smart technologies for health monitoring, information access and healthcare.
9. Intelligent transport: safer, more efficient transport through the use of digital technologies.
10. Government online: ensure that citizens have easy access to government information, services and decision-making procedures on-line.

Non-official translation

APPENDIX 3

DECREE
OF THE GOVERNMENT OF THE REPUBLIC OF ARMENIA

No. 58
28 December, 2000
Yerevan

On Recognition of the Information Technologies Industry as One of Priority Sectors of Economic Development of the Republic of Armenia

Taking into consideration the pace of development of Information Technologies in the world and its potential in Armenia, the peculiar role of Information Technologies in the modern economy and in such aspects as: the long-run development, transformation into information society, the development of other branches of industry and the attraction of investment, its exceptional importance in the capacity of economy's contemporary infrastructure, and based on the fact that the industry of Information Technologies meets the requirements for the development of the economy of RA to be recognized as a priority sector, the Government of RA decrees as follows:

1. To recognize the Information Technology Industry as one of the priority sectors in the development of the economy of RA and incorporate Information Technologies in the program of activities of the Government of RA.
2. Ministries and administrations of RA shall consider the task of assistance to and for development of Information Technologies Industry in developing programs for the corresponding fields.
3. Ministry of Industry and Trade shall:
    a) Work out and submit for government approval by February 28th a program for Information Technology industry development, involving the corresponding ministries and administrations in the program development activities;
    b) Carry out the analysis of the legislation in force, simultaneously with the development of program, having in mind the formation of legislation favorable to the development of Information Technology industry involve the enterprises acting in the field of information technologies in preparation of Information Technology industry development program;
    c) In conjunction with the ministry of Finance and Economy ensure the preparation and submission of required legislative acts drafts to the Government of RA by may 30th, 2001, proceeding from the clauses of the program;
    d) Carry out an analysis for choosing an appropriate way for creation of Information Technology field and preparation of business plans and complex program for attraction of investment in conjunction with the Ministry of Finance and Economy, within the scope of programs for loan and technical assistance for non-governmental organizations, which are being developed jointly with the World Bank;
    e) Inform the financial institutions and donor organizations about the fact of recognition of Information Technology industry as a priority sector in RA and present the priority programs and main issues on loans and technical assistance to the ITI during negotiations with the latter
4. Armenian Development Agency shall assist in the development of investment programs for Information Technology industry enterprises.
5. The Ministry of Education & Science and the National Academy of Sciences shall:
    a) Direct the development programs for public education, science and culture to the formation of Information (post-industrial) system, in conjunction with the Ministry of Culture, Youth issues and Sport.
    b) Present proposals within 3 months period on retraining of workforce meeting current demand, in conjunction with the ministry of Social Insurance of RA.
    c) Present a program on retraining of specialists who deliver courses in Information Technologies in institutes of Higher Education.

d) Increase the number of state order entrants vacancies for Information Technology field in institutes of Higher Education in the year 2001.
e) Ensure in-depth study of foreign languages in institutes of Higher Education, especially of English language for Information Technology industry specialists.
f) Intensify the study of computer applications in curriculums of institutes of Higher Education for non-IT industry specialists.
g) Ensure the compulsory computer classes in curriculums of schools of general education

6. Propose to the Central Bank of RA to assist in promotion of e-commerce and delivery of e-commerce services.
7. The Ministries of Foreign Affairs, Industry and Trade, Finance and Economy shall jointly prepare and implement activities aimed at the presentation of Armenian Information Technology industry in the international market and building of stable credibility towards the latter.
8. Ministries of State Property Management and Industry and Trade, the Municipality of Yerevan shall present proposal on provision of space required for operations of Information Technology enterprises.

PRIME MINISTER OF THE REPUBLIC OF ARMENIA

A. MARKARYAN